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GE Medical Systems
Vivid-i ™ Service Manual

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IMPORTANT PRECAUTIONS

- **THIS SERVICE MANUAL IS AVAILABLE IN ENGLISH ONLY.**
- **IF A CUSTOMER'S SERVICE PROVIDER REQUIRES A LANGUAGE OTHER THAN ENGLISH, IT IS THE CUSTOMER'S RESPONSIBILITY TO PROVIDE TRANSLATION SERVICES.**

WARNING

- **DO NOT ATTEMPT TO SERVICE THE EQUIPMENT UNLESS THIS SERVICE MANUAL HAS BEEN CONSULTED AND IS UNDERSTOOD.**
- **FAILURE TO HEED THIS WARNING MAY RESULT IN INJURY TO THE SERVICE PROVIDER, OPERATOR OR PATIENT FROM ELECTRIC SHOCK, MECHANICAL OR OTHER HAZARDS.**

- **CE MANUEL DE MAINTENANCE N'EST DISPONIBLE QU'EN ANGLAIS.**
- **SI LE TECHNICIEN DU CLIENT A BESOIN DE CE MANUEL DANS UNE AUTRE LANGUE QUE L'ANGLAIS, C'EST AU CLIENT QU'IL INCOMBE DE LE FAIRE TRADUIRE.**

AVERTISSEMENT

- **NE PAS TENTER D'INTERVENTION SUR LES ÉQUIPEMENTS TANT QUE LE MANUEL SERVICE N'A PAS ÉTÉ CONSULTÉ ET COMPRIS.**
- **LE NON-RESPECT DE CET AVERTISSEMENT PEUT ENTRAÎNER CHEZ LE TECHNICIEN, L'OPÉRATEUR OU LE PATIENT DES BLESSURES DUES À DES DANGERS ÉLECTRIQUES, MÉCANIQUES OU AUTRES.**

- **DIESES KUNDENDIENST-HANDBUCH EXISTIERT NUR IN ENGLISCHER SPRACHE.**
- **FALLS EIN FREMDER KUNDENDIENST EINE ANDERE SPRACHE BENÖTIGT, IST ES AUFGABE DES KUNDEN FÜR EINE ENTSPRECHENDE ÜBERSETZUNG ZU SORGEN.**

WARNUNG

- **VERSUCHEN SIE NICHT, DAS GERÄT ZU REPARIEREN, BEVOR DIESES KUNDENDIENST-HANDBUCH NICHT ZU RATE GEZOGEN UND VERSTANDEN WURDE.**
- **WIRD DIESE WARNUNG NICHT BEACHTET, SO KANN ES ZU VERLETZUNGEN DES KUNDENDIENSTTECHNIKERS, DES BEDIENERS ODER DES PATIENTEN DURCH ELEKTRISCHE SCHLÄGE, MECHANISCHE ODER SONSTIGE GEFAHREN KOMMEN.**

AVISO

- **ESTE MANUAL DE SERVICIO SÓLO EXISTE EN INGLÉS.**
- **SI ALGÚN PROVEEDOR DE SERVICIOS AJENO A GEMS SOLICITA UN IDIOMA QUE NO SEA EL INGLÉS, ES RESPONSABILIDAD DEL CLIENTE OFRECER UN SERVICIO DE TRADUCCIÓN.**
- **NO SE DEBERÁ DAR SERVICIO TÉCNICO AL EQUIPO, SIN HABER CONSULTADO Y COMPRENDIDO ESTE MANUAL DE SERVICIO.**
- **LA NO OBSERVANCIA DEL PRESENTE AVISO PUEDE DAR LUGAR A QUE EL PROVEEDOR DE SERVICIOS, EL OPERADOR O EL PACIENTE SUFRAN LESIONES PROVOCADAS POR CAUSAS ELÉCTRICAS, MECÁNICAS O DE OTRA NATURALEZA.**

ATENÇÃO

- **ESTE MANUAL DE ASSISTÊNCIA TÉCNICA SÓ SE ENCONTRA DISPONÍVEL EM INGLÊS.**
- **SE QUALQUER OUTRO SERVIÇO DE ASSISTÊNCIA TÉCNICA, QUE NÃO A GEMS, SOLICITAR ESTES MANUAIS NOUTRO IDIOMA, É DA RESPONSABILIDADE DO CLIENTE FORNECER OS SERVIÇOS DE TRADUÇÃO.**
- **NÃO TENTE REPARAR O EQUIPAMENTO SEM TER CONSULTADO E COMPREENDIDO ESTE MANUAL DE ASSISTÊNCIA TÉCNICA.**
- **O NÃO CUMPRIMENTO DESTE AVISO PODE POR EM PERIGO A SEGURANÇA DO TÉCNICO, OPERADOR OU PACIENTE DEVIDO A‘ CHOQUES ELÉTRICOS, MECÂNICOS OU OUTROS.**

AVVERTENZA

- **IL PRESENTE MANUALE DI MANUTENZIONE È DISPONIBILE SOLTANTO IN INGLESE.**
- **SE UN ADDETTO ALLA MANUTENZIONE ESTERNO ALLA GEMS RICHIEDE IL MANUALE IN UNA LINGUA DIVERSA, IL CLIENTE È TENUTO A PROVVEDERE DIRETTAMENTE ALLA TRADUZIONE.**
- **SI PROCEDA ALLA MANUTENZIONE DELL’APPARECCHIATURA SOLO DOPO AVER CONSULTATO IL PRESENTE MANUALE ED AVERNE COMPRESO IL CONTENUTO.**
- **NON TENERE CONTO DELLA PRESENTE AVVERTENZA POTREBBE FAR COMPIERE OPERAZIONI DA CUI DERIVINO LESIONI ALL’ADDETTO ALLA MANUTENZIONE, ALL’UTILIZZATORE ED AL PAZIENTE PER FOLGORAZIONE ELETTRICA, PER URTI MECCANICI OD ALTRI RISCHI.**

このサービスマニュアルには英語版しかありません。
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Revision History

Revision	Date	Reason for change
0	December 2004	Initial Release
1	July 2005	Updated System Labels; added Waste Electrical and Electronic Equipment (WEEE) Disposal warning
2	September 2005	Multiple Updates (hardware and software) for final release of product
3	November 2005	Added Legal Page, Cover Revision
4	June 2006	Updates (hardware and software)
5	January 2007	Updates and new spare parts

List of Effected Pages

Pages	Revision	Pages	Revision	Pages	Revision
Title Page	N/A	Chapter 2 - Pre-Installation pages 2-1 to 2-14	5	Chapter 7 - Diagnostics/ Troubleshooting pages 7-1 to 7-174	5
Important Precautions pages i to iv	5	Chapter 3 - Installation pages 3-1 to 3-160	5	Chapter 8 - Replacement Procedures pages 8-1 to 8-104	5
Legal / Rev History/LOEP pages v to vi	5	Chapter 4 - Functional Checks pages 4-1 to 4-34	5	Chapter 9 - Replacement Parts pages 9-1 to 9-12	5
Table of Contents pages vii to xxxii	5	Chapter 5 - Theory pages 5-1 to 5-98	5	Chapter 10 - Periodic Maintenance pages 10-1 to 10-36	5
Chapter 1 - Introduction pages 1-1 to 1-20	5	Chapter 6 - Service Adjustments pages 6-1 to 6-8	5	Back Cover	N/A

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Chapter 1
Introduction

Section 1-1
Overview

1-1-1 Purpose of Chapter 1

This chapter describes important issues related to safely servicing the Vivid-i™ portable ultrasound scanner. The service provider must read and understand all the information presented here before installing or servicing a unit.

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1-1-2 Purpose of Service Manual

This manual provides installation and service information for the Vivid-i™ portable ultrasound scanner, and contains the following chapters:

- *Chapter 1 - Introduction:*
  Contains a content summary and warnings.
- *Chapter 2 - Pre-Installation*
  Contains pre-installation requirements for the Vivid-i™ portable ultrasound scanner.
- *Chapter 3 - Installation*
  Contains installation procedures and an installation checklist.
- *Chapter 4 - Functional Checks*
  Contains functional checks that are recommended as part of the installation procedure, or as required during servicing and periodic maintenance.
- *Chapter 5 - Components and Function (Theory)*
  Contains block diagrams and functional explanations of the electronic circuits.
- *Chapter 6 - Service Adjustments*
  Contains instructions for performing service adjustments to the Vivid-i™ portable ultrasound scanner.
- *Chapter 7 - Diagnostics/Troubleshooting*
  Provides instructions for setting up and running diagnostic, troubleshooting and other related routines for the Vivid-i™ portable ultrasound scanner.

- *Chapter 8 - Replacement Procedures*
  Provides disassembly and reassembly procedures for all Field Replaceable Units (FRUs).
- *Chapter 9 - Renewal Parts*
  Contains a complete list of field replaceable parts for the Vivid-i™ portable ultrasound scanner.
- *Chapter 10 - Care and Maintenance*
  Provides periodic maintenance procedures for the Vivid-i™ portable ultrasound scanner.

1-1-3 Typical Users of the Basic Service Manual

This manual is intended for the following categories of users:

- GE service personnel (installation, maintenance, etc.).
- Hospital service personnel.
- Contractors (some parts of *Chapter 2 - Pre-Installation*).

1-1-4 Vivid-i™ Model Covered in this Manual

The Vivid-i™ model documented in this manual is shown in Table 1-2 below.

Table 1-2 Vivid-i™ Model

Model	Cat No.	Description	Comments
Vivid-i™ Portable Ultrasound Scanner	H45021A H45021AE	Vivid-i™ is a fully portable, phased, linear array ultrasound imaging scanner. Introduced as part of the Vivid™ family of ultrasound scanners (Vivid™ 3, Vivid™ 4, Vivid™ 7), Vivid-i™ is a laptop-style system that offers many advanced features and extreme versatility.	Depending upon the installed software, Vivid-i™ can be used for a variety of ultrasound scanning applications.

1-1-5 System History - Hardware and Software Versions

The Vivid-i™ is a compact, fully portable, phased, linear array ultrasound imaging scanner. Weighing only 5 Kgs (11 lbs), this laptop-style system is extremely versatile and, depending upon the installed software, can be used for a variety of applications.

The Vivid-i™ portable ultrasound scanner is based on parallel products in the Vivid™ family (Vivid™ 3, Vivid™ 4, Vivid™ 7). Using the same advanced technology, the innovative features and versatility of the system represent the future of ultrasound scanning.

Note: Upgrade options may be available with future versions.

1-1-6 Purpose of Operator Manual(s)

The Operator Manual(s) should be fully read and understood before operating the Vivid-i™ system, and also kept near the unit for quick reference.

Section 1-2
Important Conventions

1-2-1 Conventions Used in this Manual

1-2-1-1 Model Designations

This manual covers the Vivid-i™ ultrasound unit listed in Table 1-2 on page 1-2.

1-2-1-2 Icons

Pictures, or icons, are used wherever they will reinforce the printed message. The icons, labels and conventions used on the product and in the service information are described in this chapter.

1-2-1-3 Safety Precaution Messages

Various levels of safety precautions are found on the equipment and throughout this service manual. Different levels of severity are identified by one of the following icons which precede precautionary statements in the text.

DANGER: Indicates the presence of a hazard that will cause severe personal injury or death if the instructions are ignored.

WARNING: Indicates the presence of a hazard that can cause severe personal injury and property damage if the instructions are ignored.

CAUTION: Indicates the presence of a hazard that can cause property damage but has absolutely no personal injury risk.

Note: Notes are used to provide important information about an item or a procedure. Be sure to read the notes as the information they contain can often save you time or effort.

1-2-1-4 Standard Hazard Icons

Important information will always be preceded by the exclamation point contained within a triangle, as seen throughout this chapter. In addition to text, several different graphical icons (symbols) may be used to make you aware of specific types of hazards that could cause harm.

Table 1-3 Standard Hazard Icons

ELECTRICAL	MECHANICAL	RADIATION

LASER	HEAT	PINCH

Other hazard icons make you aware of specific procedures that should be followed.

Table 1-4 Standard Icons Indicating a Special Procedure Be Used

AVOID STATIC ELECTRICITY	TAG AND LOCK OUT	WEAR EYE PROTECTION

Section 1-3
Safety Considerations

1-3-1 Introduction

The following safety precautions must be observed during all phases of operation, service and repair of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual, violates safety standards of design, manufacture and intended use of the equipment.

1-3-2 Human Safety

Operating personnel must not remove the system covers.
Servicing should be performed by authorized personnel only.
Only personnel who have participated in Vivid-i™ Training are authorized to service the equipment.

1-3-3 Mechanical Safety

DANGER: WHEN THE VIVID-I™ SCANNER IS USED WITH THE SAFELOCK CART, MAKE SURE THE UNIT IS FIRMLY SECURED IN THE CORRECT POSITION ON THE CART SINCE IT MAY BECOME UNSTABLE AND TIP OVER.

DANGER: WHENENVER THE SAFELOCK CART IS TO BE MOVED ALONG ANY INCLINE, USE EXTREME CAUTION. MAKE SURE THAT THE VIVID-I™ SCANNER AND ALL PERIPHERALS ARE SECURELY MOUNTED ON THE CART BEFORE ATTEMPTING TO MOVE IT.

DANGER: ULTRASOUND PROBES ARE HIGHLY SENSITIVE MEDICAL INSTRUMENTS THAT CAN EASILY BE DAMAGED BY IMPROPER HANDLING. USE CARE WHEN HANDLING AND PROTECT FROM DAMAGE WHEN NOT IN USE. DO NOT USE A DAMAGED OR DEFECTIVE PROBE. FAILURE TO FOLLOW THESE PRECAUTIONS CAN RESULT IN SERIOUS INJURY AND EQUIPMENT DAMAGE.

DANGER: NEVER USE A PROBE THAT HAS BEEN SUBJECTED TO MECHANICAL SHOCK OR IMPACT. EVEN IF THE PROBE APPEARS TO BE UNBROKEN, IT MAY IN FACT BE DAMAGED.

CAUTION: The Vivid-i™ portable ultrasound scanner weighs 5kg (11 lbs.) or more, depending on carry-on peripherals when ready for use. In addition, the SafeLock cart weighs approximately 40kg (88 lbs.), excluding peripherals. Care must be used when moving the unit or replacing its parts. Failure to follow the precautions listed could result in injury, uncontrolled motion and costly damage.

ALWAYS:

Use the handle to move the system

Be sure the pathway is clear.

Use slow, careful motions.

Do not let the system strike walls or door frames.

When moving the system on inclines, make sure that the Vivid-i™ scanner and all peripherals are securely mounted on the SafeLock cart before attempting to move it.

WARNING: Always lock the SafeLock cart in its parked (locked) position after moving the system. Failure to do so could result in personal injury or equipment damage.

WARNING: Equipment damage could result if special care is not taken when transporting the Vivid-i™ system (and SafeLock cart if applicable) in a vehicle.

ALWAYS:

- **Eject any disks from the MOD (if installed).**
- **Ensure that the Vivid-i™ system is well prepared and packed in its original packaging before transporting. Special care must be taken to correctly position the packing material. For further information, refer to *Chapter 3 - Installation*.**
- **Place the probes in their carrying case.**
- **Secure the SafeLock cart in an upright position and lock the wheels (brake).**
- **Ensure that the Vivid-i™ system (and SafeLock cart if applicable) is firmly secured while inside the vehicle.**
- **Secure the system with straps or as directed otherwise to prevent motion during transport.**
- **Prevent vibration damage by driving cautiously. Avoid unpaved roads, excessive speeds, and erratic stops or starts.**

1-3-4 Electrical Safety

To minimize shock hazard, the equipment must be connected to a well grounded power source. The system is equipped with a three-conductor AC power cable. This must be plugged into an approved electrical outlet with safety grounding.

The power outlet used for this equipment should not be shared with other types of equipment. Both the system power cable and the power connector must meet international electrical standards.

1-3-4-1 Probes

All the probes for the Vivid-i™ ultrasound unit are designed and manufactured to provide trouble-free, reliable service. To ensure this, correct handling of probes is important and the following points should be noted:

- Do not drop a probe or strike it against a hard surface, as this may damage the transducer elements, acoustic lens, or housing.
- Do not use a cracked or damaged probe. In this event, call your field service representative immediately to obtain a replacement.
- Avoid pulling, pinching or kinking the probe cable, since a damaged cable may compromise the electrical safety of the probe.
- To avoid the risk of a probe accidentally falling, do not allow the probe cables to become entangled, or to be caught in the machine's wheels.

NOTE: For detailed information on handling endocavity probes, refer to the appropriate supplementary instructions for each probe. In addition, refer to the Vivid-i™ User Manual for detailed probe handling instructions.

1-3-5 Dangerous Procedure Warnings

Warnings, such as the examples below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

DANGEROUS VOLTAGES, CAPABLE OF CAUSING DEATH, ARE PRESENT IN THIS EQUIPMENT. USE EXTREME CAUTION WHEN HANDLING, TESTING AND ADJUSTING.

EXPLOSION WARNING

DO NOT OPERATE THE EQUIPMENT IN AN EXPLOSIVE ATMOSPHERE.

OPERATION OF ANY ELECTRICAL EQUIPMENT IN SUCH AN ENVIRONMENT CONSTITUTES A DEFINITE SAFETY HAZARD.

DO NOT SUBSTITUTE PARTS OR MODIFY EQUIPMENT

BECAUSE OF THE DANGER OF INTRODUCING ADDITIONAL HAZARDS, DO NOT INSTALL SUBSTITUTE PARTS OR PERFORM ANY UNAUTHORIZED MODIFICATION OF THE EQUIPMENT.

Section 1-4
Product Labels and Icons

The Vivid-i™ portable ultrasound scanner comes equipped with product labels and icons. These labels and icons represent pertinent information regarding the operation of the unit.

1-4-1 Product Label Locations

The following diagrams show the label and icons found on the Vivid-i™ ultrasound unit. All the labels and icons are described in Table 1-5 on page 1-12.

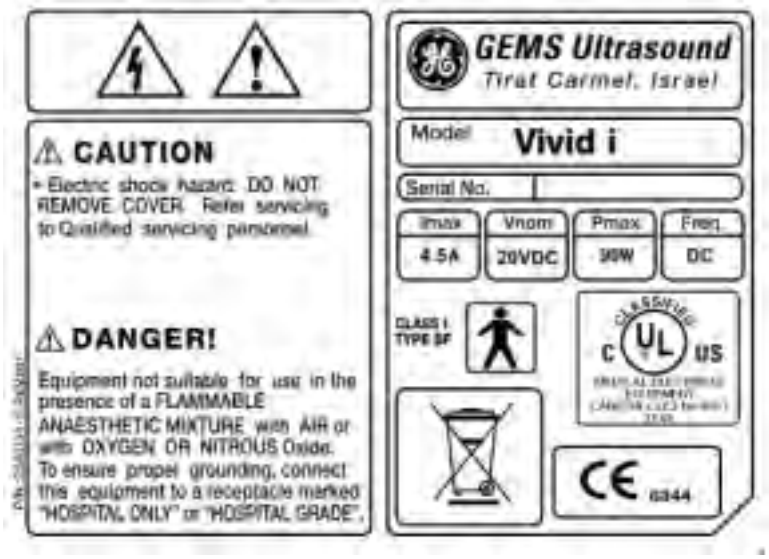

CAUTION
• Electric shock hazard. DO NOT REMOVE COVER. Refer servicing to Qualified servicing personnel.
DANGER!
Equipment not suitable for use in the presence of a FLAMMABLE ANAESTHETIC MIXTURE with AIR or with OXYGEN OR NITROUS Oxide.
To ensure proper grounding, connect this equipment to a receptacle marked "HOSPITAL ONLY" or "HOSPITAL GRADE".
GEMS Ultrasound
Tirat Carmel, Israel
Model Vivid i
Serial No.
Imax
Vnom
Pmax
Freq.
4.5A
20VDC
90W
DC
CLASS I TYPE BF
C UL US
CE 0344

Figure 1-1 Main Label (English) International

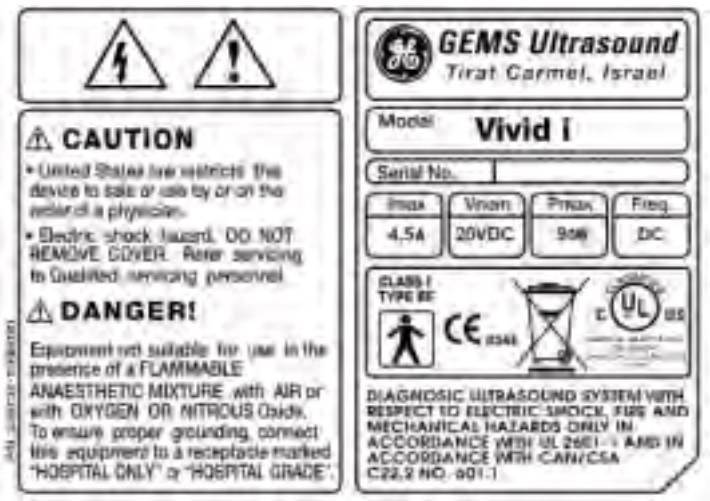

CAUTION
• Electric shock hazard. DO NOT REMOVE COVER. Refer servicing to Qualified servicing personnel.
DANGER!
presence of a FLAMMABLE ANAESTHETIC MIXTURE with AIR or with OXYGEN OR NITROUS Oxide.
To ensure proper grounding, connect this equipment to a receptacle marked "HOSPITAL ONLY" or "HOSPITAL GRADE".
GEMS Ultrasound
Tirat Carmel, Israel
Model Vivid i
Serial No.
Imax
Vnom
Pmax
Freq.
4.5A
20VDC
DC
CLASS I TYPE BF
CE 0344
C UL US
DIAGNOSIC ULTRASOUND SYSTEM WITH RESPECT TO ELECTRIC SHOCK, FIRE AND MECHANICAL HAZARDS ONLY IN ACCORDANCE WITH UL 2601-1 AND IN ACCORDANCE WITH CAN/CSA C22.2 NO. 601.1

Figure 1-2 Main Label (English) USA

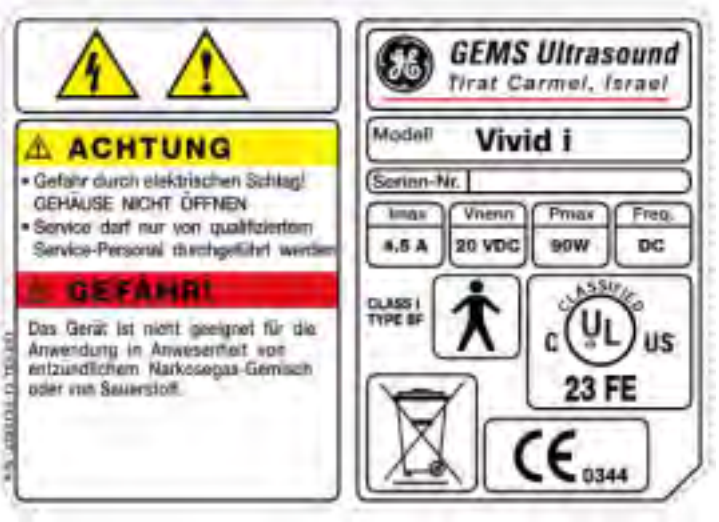


Figure 1-3 Main Label (German)

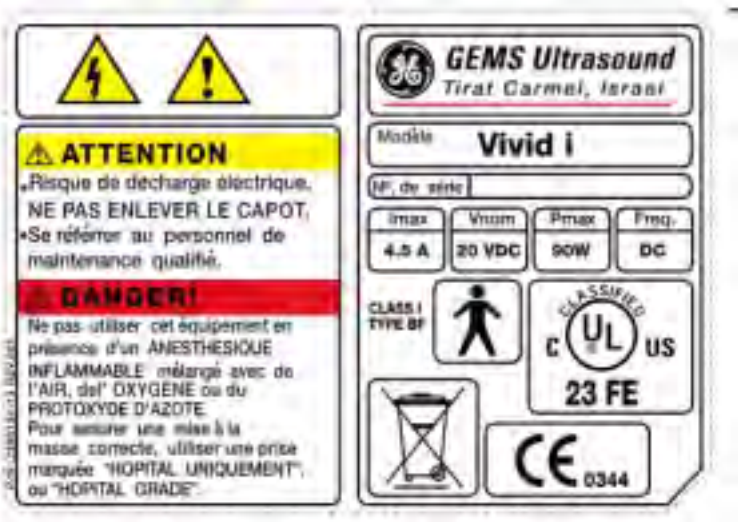

ATTENTION
•Risque de decharge electrique. NE PAS ENLEVER LE CAPOT.
•Se référer au personnel de maintenance qualifié.
DANGER!
Ne pas utiliser cet équipement en présence d'un ANESTHESIQUE INFLAMMABLE mélangé avec de l'AIR, del' OXYGENE ou du PROTOXYDE D'AZOTE.
Pour assurer une mise à la masse correcte, utiliser une prise marquée "HOPITAL UNIQUEMENT", ou "HOPITAL GRADE".
GEMS Ultrasound
Tirat Carmel, Israel
Modèle Vivid i
N°. de série
Imax 4.5 A
Vnom 20 VDC
Pmax 90W
Freq. DC
CLASS I TYPE BF
CLASSIFIED
C UL US
23 FE
CE 0344

Figure 1-4 Main Label (French)

Figure 1-5 Main Label (Spanish)

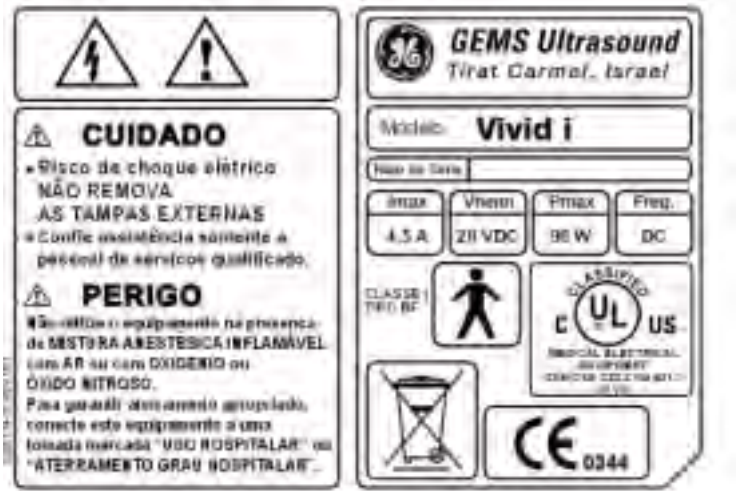


Figure 1-6 Main Label (Portuguese)

Figure 1-7 Main Label (Italian)

1-4-2 Label Descriptions

The following table shows the labels and symbols that may be found on the Vivid-i™ ultrasound unit, and provides a description of each label's purpose and location.

Table 1-5 Product Icons

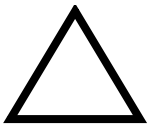
Label Name	Description	Location
Identification and Rating Plate	Manufacturer's name and address. Date of Manufacture. Model and Serial numbers. Electrical ratings (Volts, Amps, phase, and frequency.	On the base of the unit
Type/Class Label	Used to indicate the degree of safety or protection.	Bottom panel of the adapter
	Equipment Type BF (man in the box symbol) IEC 878-02-03 indicates B Type equipment having a floating applied part.	Probe connectors.
	"CAUTION" The equilateral triangle is usually used in combination with other symbols to advise or warn the user.	Various.
	"ATTENTION - Consult accompanying documents" is intended to alert the user to refer to the User Manual or other instructions when complete information cannot be provided on the label.	Various.
	"CAUTION - Dangerous voltage" (the lightning flash with arrowhead in equilateral triangle) is used to indicate electric shock hazards.	Various.
Device Listing/Certification Labels	Laboratory logos or labels that denote conformity with industry safety standards, such as UL or IEC.	On the base of the unit
	CE certification mark.	On the base of the unit

Table 1-5 Product Icons (Continued)

Label Name	Description	Location
	Equipment Type CF IEC 878-02-05 indicates equipment having a floating applied part that provides a degree of protection suitable for direct cardiac contact.	Above the ECG inlet, ECG connector and surgical probes.
CAUTION - This machine weighs...Special care must be used to avoid..."	This precaution is intended to prevent injury that may be caused by the weight of the machine if one person attempts to move it considerable distances or on an incline.	Used in the Service and User Manual which should be adjacent to equipment at all times for quick reference.
"DANGER - Risk of explosion used in..."	The system is not designed for use with flammable anesthetic gases.	Indicated in the Service Manual.
	"Protective Earth" Indicates the protective earth (grounding) terminal.	Rear of the SafeLock cart.
	"Equipotentiality" Indicates the terminal to be used for connecting equipotential conductors when interconnecting (grounding) with other equipment.	Peripherals
	“ON” indicates the power ON position of the power switch. “Standby” indicates the power stand by position of the power switch. CAUTION This Power Switch DOES NOT ISOLATE Mains Supply.	Adjacent to ON/Standby Switch
	Waste Electrical and Electronic Equipment (WEEE) Disposal This symbol indicates that waste electrical and electronic equipment must not be disposed of as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of your equipment.	On the base of the unit. On the rear of the SafeLock cart.

1-4-3 Vivid-i™ Battery Safety

NOTE: The Vivid-i™ portable ultrasound scanner is supplied with a dummy battery case, and a lithium ion battery in the battery bay, as standard.

The lithium ion battery provides power when an AC power source is not available. Lithium ion batteries last longer than conventional batteries and do not require replacement as often. You can expect one hour of battery life with a single, fully-charged battery.

The lithium ion technology used in the system's battery is significantly less hazardous to the environment than the lithium metal technology used in some other batteries (such a watch batteries). Used batteries should not be placed with common household waste products. Contact local authorities for the location of a chemical waste collection program nearest you.

NOTE: Regulations vary for different countries. Dispose of a used battery in accordance with local regulations.

CAUTION: USE ONLY BATTERIES APPROVED BY GE MEDICAL SYSTEMS AS SUITABLE FOR USE WITH THE VIVID-I™ PORTABLE ULTRASOUND SCANNER

WARNING: The Vivid-i™ battery has a safety device.
***DO NOT ATTEMPT TO DIS-ASSEMBLE OR ALTER THE BATTERY*!**
Always observe the following precautions:

- Charge batteries only when the ambient temperature is between 0^{o} and 65^{o} C (32^{o} and 149^{o} F). and discharge the batteries between -10^{o} and 55^{o} C (14^{o} and 131^{o} F)
- Do not short-circuit the battery by directly connecting the negative terminals with metal objects.
- Do not heat the battery or discard it in a fire.
- Do not expose the battery to temperatures over 60^{o} C (140^{o} F). Keep the battery away from fire and other heat sources.
- Do not charge the battery near a heat source, such as, a fire or heater.
- Do not leave the battery in direct sunlight.
- Do not pierce the battery with a sharp object, hit it, or step on it.
- Do not use a damaged battery.
- Do not apply solder to a battery.
- Do not connect the battery to an electrical power outlet.

WARNING: In the event that the Vivid-i™ portable ultrasound scanner will not be used for a long period, it is necessary to remove the battery from the system while not in use.

CAUTION: To prevent the battery bursting, igniting, or fumes from the battery causing equipment damage, always observe the following precautions:

- Do not immerse the battery in water or allow it to get wet.
- Do not place the battery into a microwave oven or pressurized container.
- If the battery leaks or emits an odor, remove it from all possible flammable sources.
- If the battery emits an odor or heat, is deformed or discolored, or in a way appears abnormal during use, recharging or storage, ***immediately remove it and stop using it***.
- If you have any questions about the battery, consult your local GE representative.
- Storage of the battery pack:

  Short term (less than 1 month): between 0^{o} C (32^{o} F) and 50^{o} C (122^{o} F).

  Long-term (more than 3 months): between 10^{o} C (50^{o} F) and 35^{o} C (95^{o} F)

Note: When storing a battery pack for more than 6 months, it is necessary to charge the battery pack at least once every 6 months in order to prevent leakage and deterioration in performance (as a result of self-discharging).

Note: When charging the battery for the first time after long-term storage, recover the battery pack to original performance through repeating several cycles of full charging and discharging.

NOTE: When shipped, the Vivid-i™ battery is in a state of being approximately 30% charged. Before use, it is necessary to fully charge and discharge the battery pack up to 3 times, in order to utilize Li-Ion smart packs.

Important:

The Vivid-i™ portable ultrasound scanner is supplied from the factory with a dummy battery. When unpacking the unit, ***do not discard the dummy battery*.**

When charging the Vivid-i™ lithium ion battery on an external charger, since the battery in fact forms one of the four legs of the scanner, removing it will leave the unit standing unbalanced. For this reason, the dummy battery should be kept, so it may be inserted in position to provide stability to the scanner while the lithium ion battery is being charged.

In addition, use of the dummy battery is recommended during transportation or long-term storage of the Vivid-i™ portable ultrasound scanner.

1-4-4 Vivid-i™ External Labels

In addition to the labels described in the previous section, additional labels may be found on the Vivid-i™ ultrasound unit, as described in the following sections:

- *Rating Labels* section, see below.
- *GND Label* section, see below.

1-4-4-1 Rating Labels

Indicates the ultrasound unit's basic power compliance and regulatory compliance information

The rating label shown below is located on the base assembly (underneath the ultrasound unit).

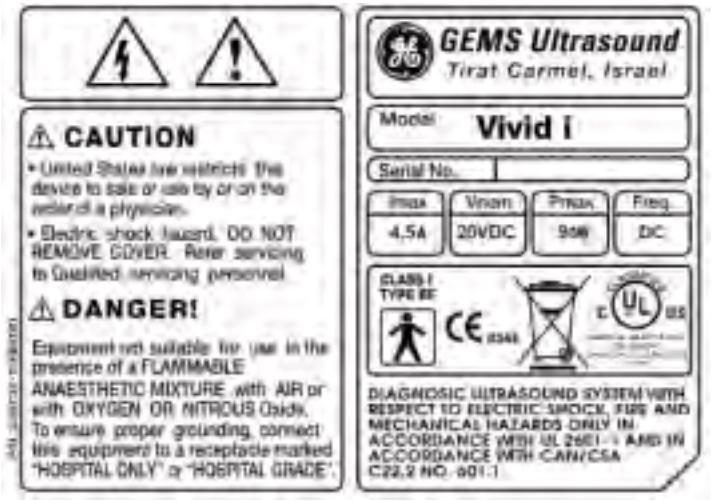


Figure 1-8 Rating Label

1-4-4-2 GND Label

Indicates the protective earth (grounding) terminal. The GND label (shown Figure 1-9 below) is located at the rear of the SafeLock cart..

Figure 1-9 GND Label

Section 1-5
EMC, EMI, and ESD

1-5-1 Electromagnetic Compatibility (EMC)

Electromagnetic compatibility describes a level of performance of a device within its electromagnetic environment. This environment consists of the device itself and its surroundings, including other equipment, power sources and persons with which the device must interface. Inadequate compatibility results when a susceptible device fails to perform as intended due to interference from its environment, or when the device produces unacceptable levels of emission. This interference is often referred to as radio–frequency or electromagnetic interference (RFI/EMI) and can be radiated through space or conducted over interconnecting power or signal cables. In addition to electromagnetic energy, EMC also includes possible effects from electrical fields, magnetic fields, electrostatic discharge and disturbances in the electrical power supply.

1-5-2 CE Compliance

The Vivid-i™ portable ultrasound scanner conforms to all applicable conducted and radiated emission limits and to immunity from electrostatic discharge, radiated and conducted RF fields, magnetic fields and power line transient requirements.

For applicable standards refer to the Safety Chapter in the Vivid-i™ User Manual.

NOTE: For CE Compliance, it is critical that all covers, screws, shielding, gaskets, mesh and clamps are in good condition and installed tightly without skew or stress. Proper installation following all comments noted in this service manual is required in order to achieve full EMC performance.

1-5-3 Electrostatic Discharge (ESD) Prevention

CAUTION: DO NOT TOUCH ANY BOARDS WITH INTEGRATED CIRCUITS PRIOR TO TAKING THE NECESSARY ESD PRECAUTIONS:

1.ALWAYS CONNECT YOURSELF, VIA AN ARM-WRIST STRAP CONNECTED TO THE BOTTOM COVER WHENEVER YOU OPEN THE SYSTEM FOR MAINTENANCE.

2.FOLLOW GENERAL GUIDELINES FOR HANDLING OF ELECTROSTATIC SENSITIVE EQUIPMENT.

1-5-4 Standards Used

To fulfill the requirements of relevant EC directives and/or European Harmonized/International standards, the following documents/standards have been used:

Table 1-6 Standards Used

Standard/Directive	Scope
89/336/EEC	EMC Directive.
93/42/EEC	Medical Device Directive.
IEC 801-2	Electrostatic Discharge.
IEC 801-3	Radiated Electromagnetic Field.
IEC 801-4	Electrical Fast Transient/Burst.
IEC 805-1	Surge.
EN 55011/CISPR 11	Electromagnetic Susceptibility.
EN 60601-1/IEC 601-1/UL 2601-1	Medical Electrical Equipment; General Requirements for Safety.
EN 61157/ IEC 61157	Requirements for the declaration of the acoustic output of medical diagnostic ultrasonic equipment.

NOTE: For CE Compliance, it is critical that all covers, screws, shielding, gaskets, mesh and clamps are in good condition and installed tightly without skew or stress. Proper installation following all comments noted in this service manual is required in order to achieve full EMC performance.

1-5-5 Lockout/Tagout Requirements (For USA Only)

Follow OSHA Lockout/Tagout requirements to protect service personnel from injuries caused by unexpected energizing or start-up of equipment during service, repair, or maintenance.

Section 1-6
Customer Assistance

1-6-1 Contact Information

If this equipment does not work as indicated in this service manual or in the *Vivid-i™ User Manual*, or if you require additional assistance, please contact the local distributor or appropriate support resource, as listed below.

Prepare the following information before you call:

- System ID and/or serial number.
- Software version.

Table 1-7 GE Contact Information

Location	Phone Number
USA/ Canada GE Medical Systems Ultrasound Service Engineering 4855 W. Electric Avenue Milwaukee, WI 53219 Customer Answer Center	Phone: +1-800-437-1171 Phone: +1-800-321-7937 Phone: +1-800-682-5327 Phone: +1-262-524-5698 Fax: +1-414-647-4125
Latin America GE Medical Systems Ultrasound Service Engineering 4855 W. Electric Avenue Milwaukee, WI 53219 Customer Answer Center	Phone: +1-262-524-5300 Phone: +1-262-524-5698 Fax: +1-414-647-4125
Europe GE Ultraschall Deutschland GmbH& Co. KG BeethovenstraBe 239 Postfach 11 05 60, D-42665 Solingen Germany	General Imaging: +49 (212) 2802 207 Cardiac: +49 (212) 2802 208 Fax: +49 212 2802 431
Asia (Singapore/ Japan) GE Ultrasound Asia Service Department - Ultrasound 298 Tiong Bahru Road #15-01/06 Central Plaza Singapore 169730	Phone: +65-277-3487 Fax: +65-272-3997 Phone: +81-426-48-2950 Fax: +81-426-48-2902

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Chapter 2
Pre-Installation

Section 2-1
Overview

2-1-1 Purpose of Chapter 2

This chapter provides the information required to plan and prepare for the installation of a Vivid-i™ ultrasound unit. Included are descriptions of the electrical and facility requirements that must be met by the purchaser. A worksheet is provided at the end of this chapter (see Figure 2-2 on page 2-11) to help ensure that all the required network information is available, prior to installation.

Table 2-1 Contents in Chapter 2

Section	Description	Page Number
2-1	Overview	2-1
2-2	Console Requirements	2-2
2-3	Facility Needs	2-7

Section 2-2
Console Requirements

2-2-1 Unit Environmental Requirements

Table 2-2 Environmental Requirements

Requirement	Temperature	Relative Humidity (non-condensing)	Air Pressure
Operational	10 — 40°C (50 — 104°F)	30 — 75%	700 — 1060 hPa
Storage	- 5 — 50°C (23 — 122°F)	10 — 90%	700 — 1060 hPa
Transport	- 5 — 50°C (23 — 122°F)	10 — 90%	700— 1060 hPa

CAUTION: If the system has been in storage or has been transported, please see the acclimation requirements *before* powering ON and/or using the system. Refer to the *Installation Warnings* section on page 3-2.

2-2-2 Cooling Requirements

The cooling requirement for the Vivid-i™ ultrasound unit environment is 3500 BTU/hr. This figure does not include the cooling required for lights, people, or other equipment in the room.

Note: Each person in the room places an additional 300 BTU/hr demand on the environmental cooling.

2-2-3 Lighting Requirements

For system installation, updates and repairs, bright lighting is required. However, operator and patient comfort may be optimized if the room lighting is subdued and indirect when a scan is being performed. Therefore, a combination lighting system (dim/bright) is recommended. Keep in mind that lighting controls and dimmers can be a source of EMI which could degrade image quality. These controls should be selected to minimize possible interference.

2-2-4 Time and Manpower Requirements

Site preparation takes time. Begin pre-installation checks as soon as possible to allow sufficient time to make any required changes. If possible, begin these checks as many as six weeks before system delivery.

CAUTION: Only one person is required to unpack the Vivid-i™ ultrasound unit; at least two people must be available to unpack the SafeLock Cart. Attempts to move the SafeLock Cart considerable distances (or on an incline) by one person alone, could result in personal injury, and/or damage to the system.

2-2-5 Electrical Requirements

NOTE: GE Medical Systems requires a dedicated mains power line and Ground for the proper operation of its Ultrasound equipment. This dedicated power line shall originate at the last distribution panel before the system.

Sites with a mains power system with defined Neutral and Live:

The dedicated line shall consist of one phase, a neutral (not shared with any other circuit), and a full size Ground wire from the distribution panel to the Ultrasound outlet.

Sites with a mains power system without a defined Neutral:

The dedicated line shall consist of one phase (two lines), not shared with any other circuit, and a full size Ground wire from the distribution panel to the Ultrasound outlet.

NOTE: Please note that image artifacts can occur, if at any time within the facility, the Ground from the main facility's incoming power source to the Ultrasound unit is only a conduit.

2-2-5-1 Vivid-i™ Power Requirements

Electrical specifications for the Vivid-i™ system are as follows:

Table 2-3 Electrical Requirements

Adaptor	Input Voltage	Output Voltage	Tolerances	Op. Current	Frequency
AC DC converter	100V AC to 240V AC	20V	±10%	0.5 to 1A	50-60 Hz

2-2-5-2 Inrush Current

Inrush current is not a factor for consideration, due to the inrush current limiting properties of the power supplies.

Table 2-4 Inrush Current

Voltage	Inrush Current	
	Console Only	Console with all Peripherals
100 V	2.3 A	4.5 A
240 V	4.5 A	9 A

2-2-5-3 Site Power Outlets

A dedicated AC power outlet must be within reach of the unit without requiring the use of extension cords. Other outlets adequate for the external peripherals, medical and test equipment required to support this unit must also be present and located within 1 m (3.2 ft) of the unit. Electrical installation must meet all current local, state, and national electrical codes.

2-2-5-4 Mains Power Plug

The Vivid-i™ portable ultrasound scanner is supplied with a mains power plug, as standard. In the event that the unit arrives without a power plug, or with the wrong plug, contact your GE dealer. When necessary, the installation engineer will supply the appropriate power plug to meet the applicable local regulations.

2-2-5-5 Power Stability Requirements

- **Voltage drop-out**

Max 10 ms.

- **Power Transients**

(All applications)

Less than 25% of nominal peak voltage for less than 1 millisecond for any type of transient, including line frequency, synchronous, asynchronous, or aperiodic transients.

2-2-6 EMI Limitations

Ultrasound machines are susceptible to Electromagnetic Interference (EMI) from radio frequencies, magnetic fields, and transients in the air or wiring. They also generate EMI. The Vivid-i™ ultrasound unit complies with limits as stated on the EMC label. However, there is no guarantee that interference will not occur in a particular installation.

Note: Possible EMI sources should be identified before the unit is installed, and should not be on the same line as the ultrasound system. A dedicated line should be used for the ultrasound system.

Electrical and electronic equipment may produce EMI unintentionally as the result of a defect. Sources of EMI include the following:

- Medical lasers.
- Scanners.
- Cauterizing guns.
- Computers.
- Monitors.
- Fans.
- Gel warmers.
- Microwave ovens.
- Portable phones.
- Broadcast stations and mobile broadcasting machines.

The following table lists recommendations for preventing EMI:

Table 2-5 EMI Prevention/ Abatement

EMI Rule	Details
Ground the unit.	Poor grounding is the most likely reason an ultrasound unit will have noisy images. Check the grounding of the power cord and power outlet.
Be aware of RF sources.	Keep the unit at least 5m (16.4 ft) away from other EMI sources. Special shielding may be required to eliminate interference problems caused by high frequency, high powered radio or video broadcast signals.
Replace and/or reassemble all screws, RF gaskets, covers and cores.	After you finish repairing or updating the system, replace all covers and tighten all screws. Any cable with an external connection requires a magnet wrap at each end. Install the shield over the front of the card cage. Loose or missing covers or RF gaskets allow radio frequencies to interfere with the ultrasound signals.
Replace broken RF gaskets.	If more than 20% or a pair of the fingers on an RF gasket are broken, replace the gasket. Do not turn ON the unit until any loose metallic part is removed and replaced, if required.
Do not place labels where RF gaskets touch metal.	Never place a label where RF gaskets meet the unit. Otherwise, the gap created will permit RF leakage. In case a label has been found in such a location, move the label to a different, appropriate location.
Use GE-specified harnesses and peripherals.	The interconnect cables are grounded and require ferrite beads and other shielding. Cable length, material, and routing are all important; do not make any changes that do not meet all specifications.
Take care with cellular phones.	Cellular phones may transmit a 5 V/m signal that causes image artifacts.
Properly address peripheral cables.	Do not allow cables to lie across the top of the system. Loop any peripheral cable excess length into one bundle.

2-2-7 Probe Environmental Requirements

Table 2-6 Probe Operation and Storage Temperatures

	Electronics
Operation	10 — 40^{o}C (50 — 104^{o}F)
Storage	-20 — 50^{o}C (-4 — 122^{o}F)

Note: System and electronic probes are designed for storage temperatures of -20^{o} to +50^{o} C. When exposed to large temperature variations, the probes should be kept at room temperature for a *minimum* of ***10 hours*** before use.

Section 2-3
Facility Needs

2-3-1 Purchaser Responsibilities

The work and materials required to prepare the site are the responsibility of the purchaser. To avoid delay, complete all pre-installation work before delivery. Use the Pre-installation Check List (provided in Table 2-7 on page 2-13) to verify that all the required steps have been completed.

Purchaser responsibilities include:

- Procuring the required materials.
- Completing the preparations prior to delivery of the ultrasound system.
- Paying the costs of any alterations and modifications not specifically provided for in the sales contract.

Note: All relevant preliminary electrical installations at the prepared site must be performed by licensed electrical contractors. Other connections between electrical equipment, and calibration and testing, must also be performed by qualified personnel. The products involved (and the accompanying electrical installations) are highly sophisticated and special engineering competence is required. All electrical work on these products must comply with the requirements of applicable electrical codes. The purchaser of GE equipment must utilize only qualified personnel to perform electrical servicing of the equipment.

To avoid delays during installation, the individual or team who will perform the installation should be notified at the earliest possible date (preferably prior to installation), of the existence of any of the following variances:

- Use of any non-listed product(s).
- Use of any customer provided product(s).
- Placement of an approved product further from the system than the interface kit allows.

The prepared site must be clean prior to delivery of the system. Carpeting is not recommended because it collects dust and creates static. Potential sources of EMI should also be investigated before delivery. Dirt, static, and EMI can negatively impact system reliability.

2-3-2 Mandatory Site Requirements

The following are mandatory site requirements. Additional (optional) recommendations, as well as a recommended ultrasound room layout, are provided in section *2-3-3 - Site Recommendations* (see below).

- A dedicated single branch power outlet of adequate amperage (see Table 2-3 on page 2-3.) that meets all local and national codes and is located less than 2.5 m (8.2 ft) from the unit's proposed location. Refer to the *Electrical Requirements* section on page 2-3.
- A door opening of at least 76 cm (2.5 ft) in width (if using the SafeLock Cart).
- The proposed location for the unit is at least 0.2 m (0.67 ft) from the walls, to enable cooling.
- Power outlet and place for any external peripheral are within 2 m (6.5 ft.) of each other with peripheral within 1 m of the unit to connect cables.
- Power outlets for other medical equipment and gel warmer.
- Power outlets for test equipment within 1 m (3.3 ft) of the ultrasound unit.
- Clean and protected space for storage of probes (either in their case or on a rack).
- Material to safely clean probes (performed using a plastic container, never metal).
- In the case of a network option:
  - An active network outlet in the vicinity of the ultrasound unit.
  - A network cable of appropriate length (regular Pin-to-Pin network cable).
  - An IT administrator who will assist in configuring the unit to work with your local network. A fixed IP address is required. Refer to the form provided in Figure 2-2 on page 2-11 for network details that are required.

Note: All relevant preliminary network outlets installations at the prepared site must be performed by authorized contractors. The purchaser of GE equipment must utilize only qualified personnel to perform servicing of the equipment.

2-3-3 Site Recommendations

The following are (optional) site recommendations. Mandatory site requirements are provided in the *Mandatory Site Requirements* section, above.

- Door opening of 92 cm (3 ft) in width (if using the SafeLock Cart).
- Accessible circuit breaker for a dedicated power outlet.
- Sink with hot and cold running water.
- Receptacle for bio–hazardous waste, for example, used probe sheaths.
- Emergency oxygen supply.
- Storage area for linens and equipment.
- Nearby waiting room, lavatory, and dressing room.
- Dual level lighting (bright and dim).
- Lockable cabinet for software and manuals.

2-3-3-1 Recommended Ultrasound Room Layout

Figure 2-1 below shows a floor plan illustrating the recommended layout of the Ultrasound Room and depicting the minimal room layout requirements.

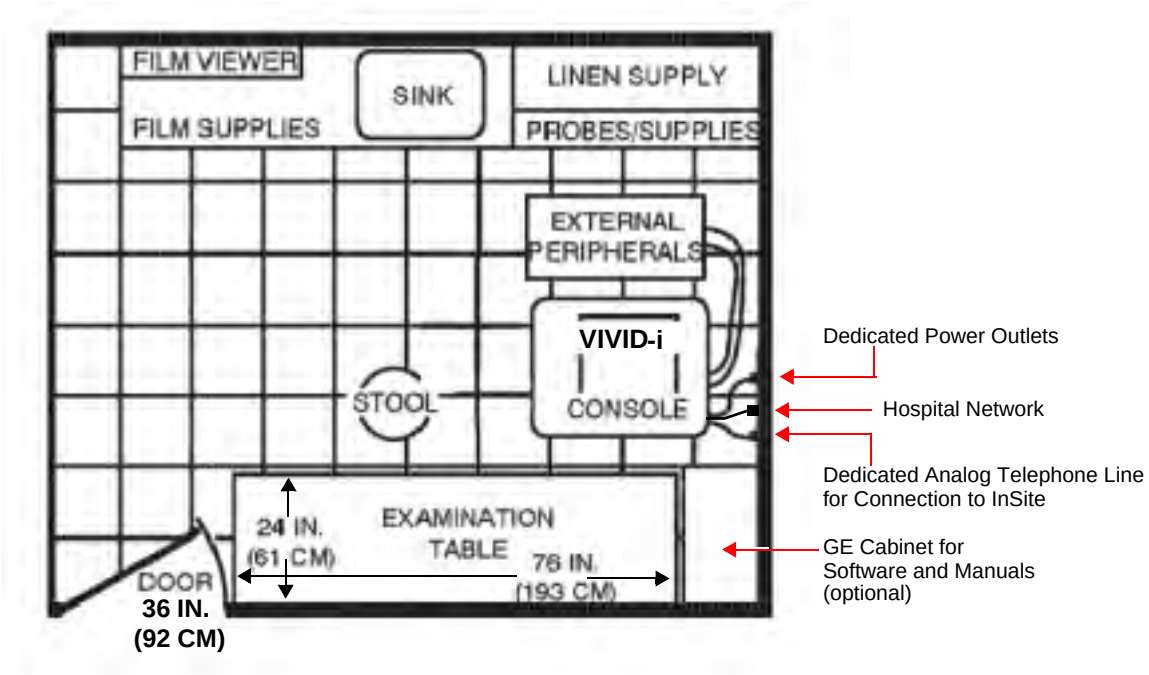

Figure 2-1 Recommended Floor Plan 4.3m x 5.2m (14 ft x 17 ft)

2-3-4 Networking Pre-Installation Requirements

2-3-4-1 Stand-alone Unit (without Network Connection)

None.

2-3-4-2 Unit Connected to Hospital's Network

Supported networks:

- Wireless LAN

2-3-4-3 Purpose of the DICOM Network Function

DICOM services provide the operator with clinically useful features for moving images and patient information over a hospital network. Examples of DICOM services include the transfer of images to workstations for viewing or transferring images to remote printers. As an added benefit, transferring images in this manner frees up the on-board monitor and peripherals, enabling viewing to be done while scanning continues. With DICOM, images can be archived, stored, and retrieved faster, easier, and at a lower cost.

2-3-4-4 DICOM Option Pre-Installation Requirements

To configure the Vivid-i™ ultrasound unit to work with other network connections, the network administrator must provide the required information, which should include the following:

- **Vivid-i™ Details**: DICOM network details for the Vivid-i™ unit, including the host name, local port, IP address, AE title and net mask.
- **Routing Information**: IP addresses for the default gateway and other routers in use at the site.
- **DICOM Application Information**: Details of the DICOM devices in use at the site, including the DICOM host name, AE title and IP addresses.

Section 2-4
Connectivity Installation Worksheet

Site System Information

Site:

Dept:

Vivid-i™ SN: Type:

Floor:

Room:

REV:

Comments:

CONTACT INFORMATION

Name	Title	Phone	E-Mail Address

TCP/IP Settings

Scanner IP Settings

Name - AE Title:

IP Address:

Subnet Mask:

Default Gateway:

Remote Archive Setup
(Echo Server/GEMNet Server/EchoPac PC)

Name - AE Title:

IP Address:

Subnet Mask:

Default Gateway:

Server Name:

Remote DB User Name:

Services (Destination Devices)

	Device Type	Manufacturer	Name	IP Address	Port	AE Title
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Figure 2-2 Connectivity Installation Worksheet

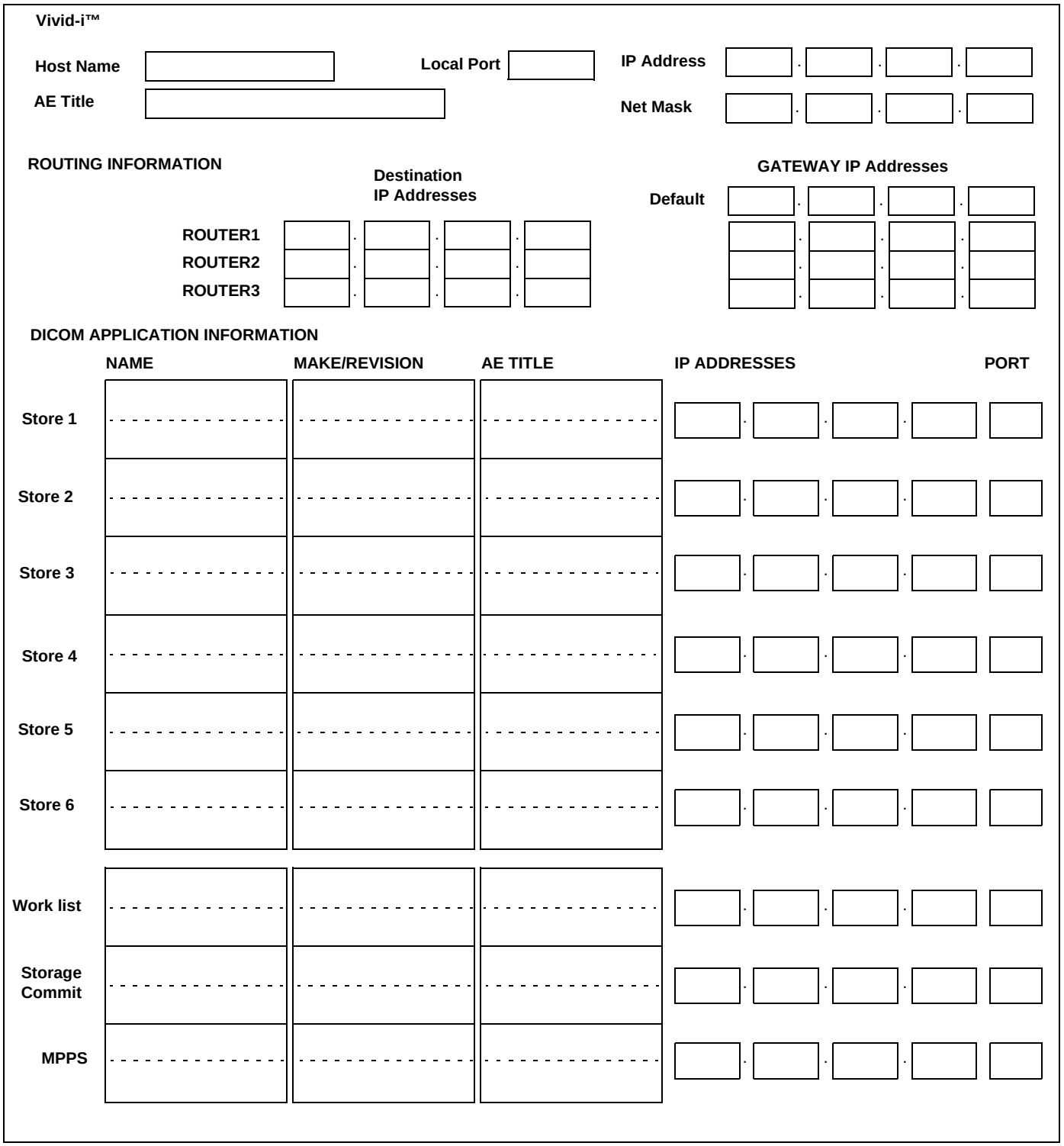

Figure 2-3 Worksheet for DICOM Network Information

Table 2-7 Vivid-i™ Pre-Installation Check List

Action	Yes	No
Schedule at least 3 hours for installation of the system.		
Notify installation team of the existence of any variances from the basic installation.		
Make sure system and probes have been subject to acclimation period.		
Environmental cooling is sufficient.		
Lighting is adjustable to adapt to varying operational conditions of the scanner.		
Electrical facilities meet system requirements.		
EMI precautions have been taken and all possible sources of interference have been removed.		
Mandatory site requirements have been met.		
If a network is used, IP address has been set for the system and a dedicated network outlet is available.		

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Chapter 3
Installation

Section 3-1
Overview

3-1-1 Purpose of Chapter 3

This chapter provides instructions for installing the Vivid-i™ ultrasound unit. Before beginning the installation process, an appropriate site must be prepared, as described in *Chapter 2 - Pre-Installation*. Once the site has been prepared, installation can proceed as described in this chapter.

Included in this chapter are guidelines for transporting the unit to a new site, as well as procedures that describe how to receive and unpack the equipment, and (if necessary) how to file a damage or loss claim. Instructions for checking and testing the unit, probes, and external peripherals for electrical safety are also provided.

NOTE: Depending on the customer's specific requirements, the Vivid-i™ portable ultrasound scanner may have been supplied with or without the SafeLock Cart (optional). Where applicable, the installation procedures for each scenario are clearly identified in this chapter.

Table 3-8 Contents in Chapter 3

Section	Description	Page Number
3-1	Overview	3-1
3-2	Installation Reminders	3-2
3-3	Receiving and Unpacking the Equipment	3-4
3-4	Preparing for Installation	3-15
3-5	Completing the Hardware Installation	3-29
3-6	Mounting the Vivid-i™ on the SafeLock Cart (optional)	3-56
3-7	Configuration	3-59
3-8	Connectivity Setup	3-74
3-9	Storing and Transporting the Unit	3-157
3-10	Completing the Installation Paperwork	3-158

Section 3-2
Installation Reminders

3-2-1 Average Installation Time

The Vivid-i™ installation and functional checkout will take approximately one hour; Vivid-i™ consoles with optional equipment may take slightly longer.

Once the site has been prepared, the average installation time required is shown in Table 3-9 below.

Table 3-9 Average Installation Time

Description	Average Installation Time	Comments
Unpacking the scanner	20 minutes	
Installing the scanner	30 minutes	Time may vary, according to the required configuration
DICOM Option (connectivity)	30 minutes	Time may vary, according to the required configuration

3-2-2 Installation Warnings

1.) The Vivid-i™ portable ultrasound scanner weighs only 5 Kgs (11 lbs), without options. However since the SafeLock Cart weighs approximately 40 kg (88 lbs), two persons are always required to unpack it.

2.) There are no operator-serviceable components. To prevent shock, do not remove any covers or panels. Should problems or malfunctions occur, unplug the power cord. Only qualified service personnel should carry out servicing and troubleshooting.

NOTE: For information on shipping carton labels, refer to Figure 3-4 on page 3-5 and Figure 3-8 on page 3-7.

3-2-2-1 System Acclimation Time

Following transport, the Vivid-i™ system may be very cold, or hot. Allow time for the system to acclimate before being switched ON. Acclimation requires 1 hour for each 2.5°C increment, when the temperature of the system is below 10°C or above 35°C.

CAUTION **Turning the system ON after arrival at the site - without allowing time for acclimation - may cause system damage!**

Table 3-10 Vivid-i™ System Acclimation Time

°C	60	55	50	45	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40
°F	140	131	122	113	104	96	86	77	68	59	50	41	32	23	14	5	-4	-13	-22	-31	-40
Hrs	8	6	4	2	0	0	0	0	0	0	0	2	4	6	8	10	12	14	16	18	20

3-2-3 Safety Reminders

DANGER: WHEN USING ANY TEST INSTRUMENT THAT IS CAPABLE OF OPENING THE AC GROUND LINE (I.E., METER'S GROUND SWITCH IS OPEN), DO NOT TOUCH THE UNIT!

WARNING: Two people are required to unpack the SafeLock Cart, as it is heavy. Two people are always required whenever a part weighing 19kg (35 lb.) or more must be lifted.

CAUTION: If the unit is very cold or hot, do NOT turn ON power to the unit until it has had sufficient time to acclimate to its operating environment.

CAUTION: To prevent electrical shock, connect the unit to a properly grounded power outlet. Do NOT use a three-prong to two-prong adapter, as this defeats safety grounding.

CAUTION: Do NOT wear the ESD wrist strap when you work on live circuits where more than 30 V peak is present.

CAUTION: Do NOT operate the unit unless all board covers and frame panels are securely in place, to ensure optimal system performance and cooling. (When covers are removed, EMI may be present).

WARNING: ACOUSTIC OUTPUT HAZARD
Although the ultrasound energy transmitted from the Vivid-i™ portable ultrasound scanner is within AIUM/NEMA standards and FDA limitations, avoid unnecessary exposure. Ultrasound energy can produce heat and mechanical damage.

Note: The *Vivid-i™ User Manual* should be fully read and understood before operating the unit. Keep the manual near the unit for reference.

Section 3-3
Receiving and Unpacking the Equipment

CAUTION: Please read this section fully before unpacking the Vivid-i™ ultrasound unit.

The Vivid-i™ ultrasound unit, together with the optional SafeLock Cart (if ordered), peripherals, probes, cables, and accessories, are shipped from the factory in a single cardboard shipping carton mounted on a raised wooden base - see Figure 3-5 on page 3-6.

Where the specific customer requirements are for a Vivid-i™ ultrasound unit with peripherals *only* (without SafeLock Cart), this is shipped in a smaller-sized cardboard shipping carton mounted on a raised wooden base - see Figure 3-6 on page 3-6.

Similarly, if a SafeLock Cart *only* has been ordered, this is shipped in a large-sized cardboard shipping carton mounted on a raised wooden base - see Figure 3-7 on page 3-7.

Unpacking instructions for each type of shipping carton are provided separately in the following sections:

- Unpacking the Vivid-i™ with Peripherals and SafeLock Cart on page 3 - 8
- Unpacking the Vivid-i™ with Peripherals on page 3 - 10
- Unpacking the Vivid-i™ SafeLock Cart on page 3 - 11

NOTE: *For details of weights and dimensions of all three shipping cartons, refer to Table 3-11 on page 3-7.*

Each cardboard shipping carton is sealed with plastic tape and secured on the outside with plastic straps. The interior of the carton is fully lined with re-sealable water-proof wrapping to protect the contents from external moisture; silica gel bags are also placed among the contents to absorb any condensation or moisture within the carton.

Before unpacking the unit

- Inspect the carton for visible damage.
- Inspect the *Drop and Tilt* indicators (on the Shock-watch and Tilt-watch labels, respectively) for evidence of accidental shock or tilting during transit (damage incident) - refer to Figure 3-4 below.

NOTICE

After unpacking the unit:
It is recommended to keep and store the shipping carton and all other packing materials (including the support foams, anti-static plastic cover, etc.), in case the unit (and/or SafeLock Cart) has to be moved to a different location in the future.

For warranty purposes, storage of the above is required for one year from date of purchase.

Important:

The Vivid-i™ portable ultrasound scanner is supplied from the factory with a dummy battery. When unpacking the unit, ***do not discard the dummy battery*.**

When charging the Vivid-i™ lithium ion battery on an external charger, since the battery in fact forms one of the four legs of the scanner, removing it will leave the unit standing unbalanced. For this reason, the dummy battery should be kept, so it may be inserted in position to provide stability to the scanner while the lithium ion battery is being charged.

In addition, use of the dummy battery is recommended during transportation or long-term storage of the Vivid-i™ portable ultrasound scanner.

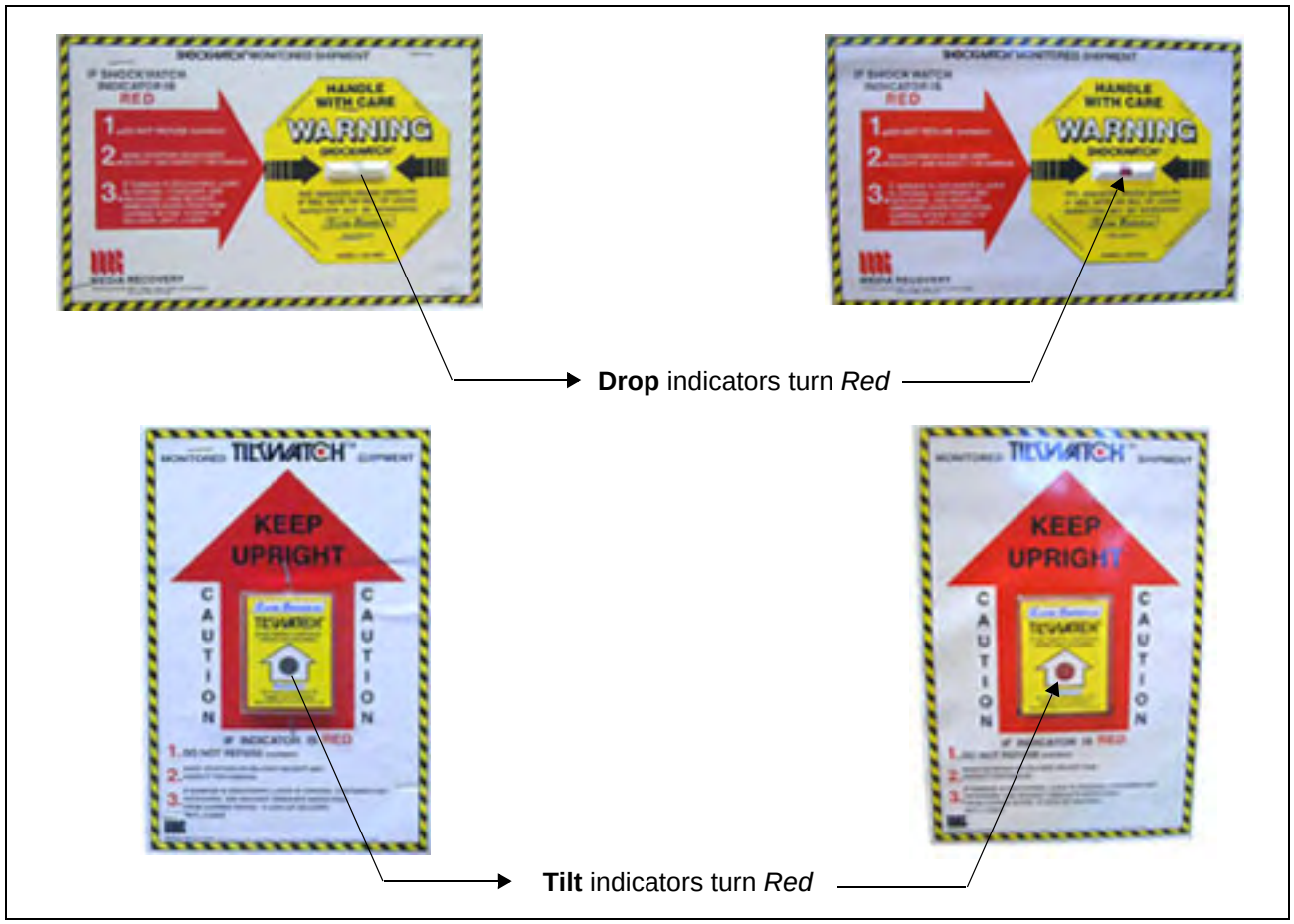


Figure 3-4 Drop and Tilt Indicators

If the carton is damaged, or if either the Drop or Tilt indicators have turned red (indicating damage incident*), please inform the GE Medical Systems sales representative immediately. In addition, mark on the shipping consignment note or packing slip/post-delivery checklist (in the "Package" column) that the Tilt and/or Drop indicators show* damage incident.

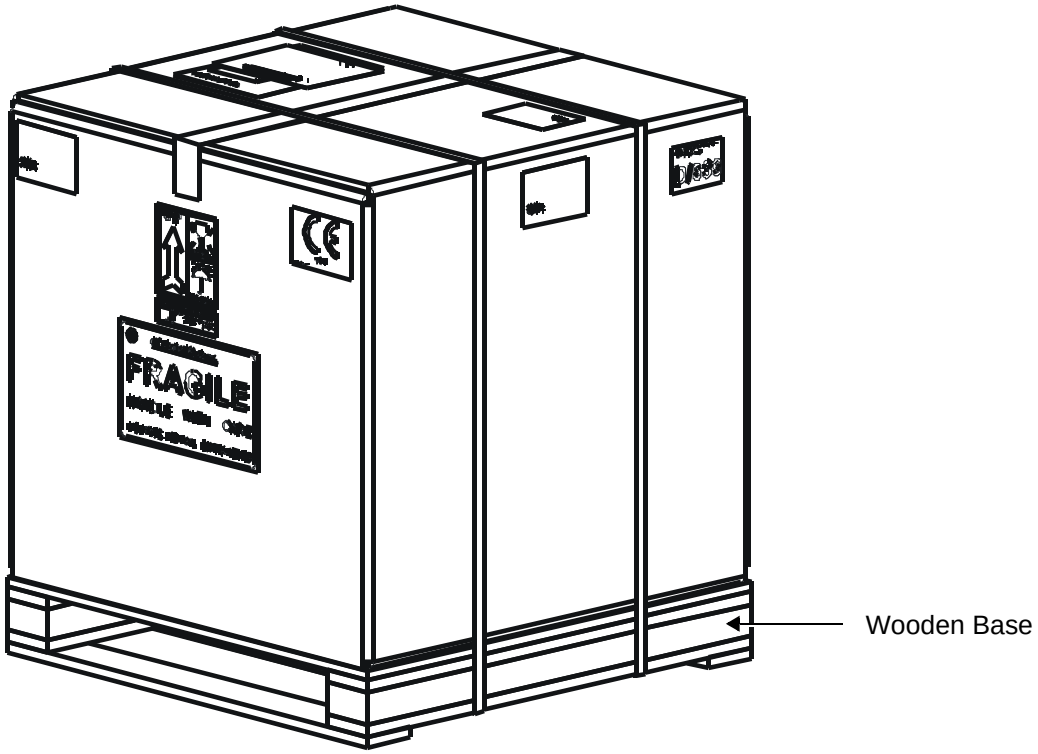


Figure 3-5 Shipping Carton - Vivid-i™ with Peripherals and SafeLock Cart

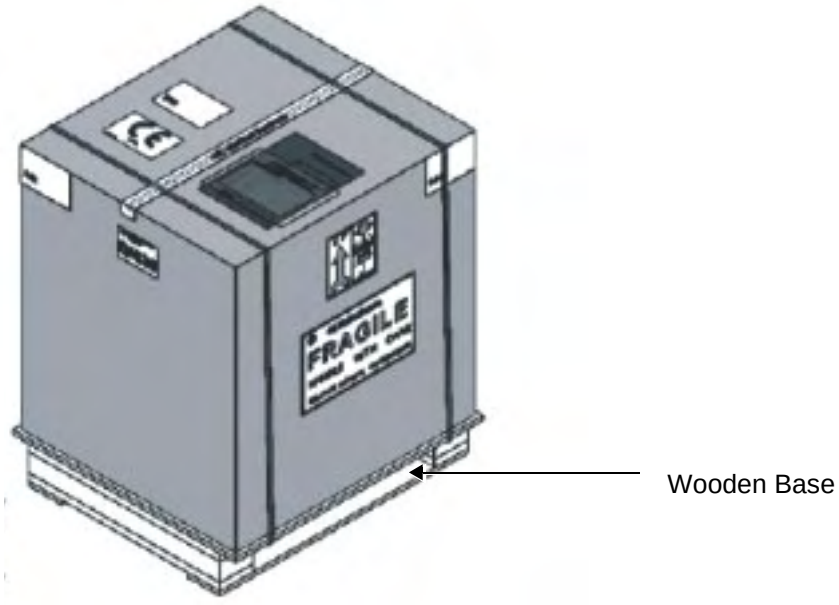


Figure 3-6 Shipping Carton - Vivid-i™ with Peripherals Only

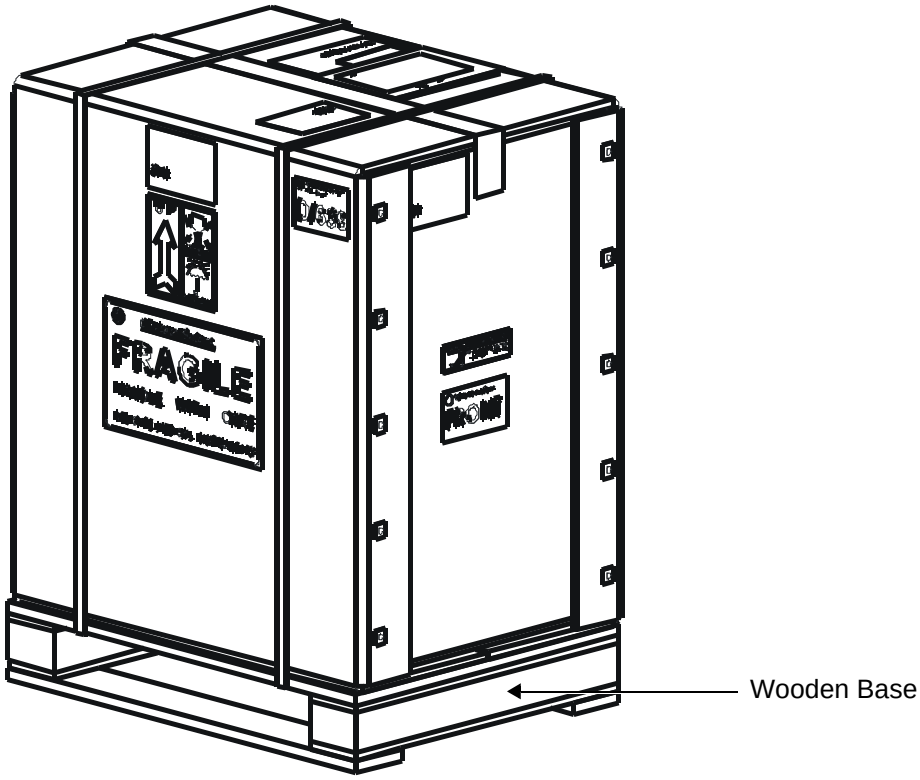


Figure 3-7 Shipping Carton - Vivid-i™ SafeLock Cart Only

Table 3-11 Shipping Cartons - Dimensions and Weights

Description	Height	Width	Depth	Weight[a]
Vivid-i™ scanner with SafeLock Cart (incl. peripherals and accessories)	160 cm 63 ins	100 cm 39 ins	100 cm 39 ins	100 kgs 220 lbs
Vivid-i™ scanner - no SafeLock Cart (incl. peripherals and accessories)	50 cm 20 ins	100 cm 39 ins	100 cm 39 ins	60 kgs 132 lbs
Vivid-i™ SafeLock Cart only	970 cm 382 ins	760 cm 299 ins	575 cm 226 ins	45 kgs 99 lbs

a. Weight is approximate and will vary depending upon the supplied peripherals

Figure 3-8 Additional Labels on Shipping Carton

3-3-1 Unpacking the Cardboard Shipping Carton

As previously described, the Vivid-i™ ultrasound unit is packed in a single cardboard shipping carton comprising a durable outer cardboard carton cover and a wooden platform base; these are firmly joined together with steel straps. After completing a visual inspection of the shipping carton and *Drop/Tilt* indicators, proceed to the unpacking instructions below, as appropriate.

3-3-1-1 Unpacking the Vivid-i™ with Peripherals and SafeLock Cart

1.) Cut the steel straps securing the shipping carton to the wooden base - see Figure 3-5 on page 3-6.

CAUTION: When using sharp tools to open packing materials, take care to avoid cutting or damaging any of the contents.

2.) Carefully cut the adhesive tape used to close the shipping carton lid, and open the carton from the top.

3.) Carefully cut the adhesive tape used to close the front side of the shipping carton, remove the five staples from each side, then drop the side *downwards* until it is resting on the floor, as shown in Figure 3-9 below.

Note: The front side of the carton is re-inforced with wooden guide rails and, when dropped down in the open position, forms a strong ramp used for wheeling out the SafeLock Cart.

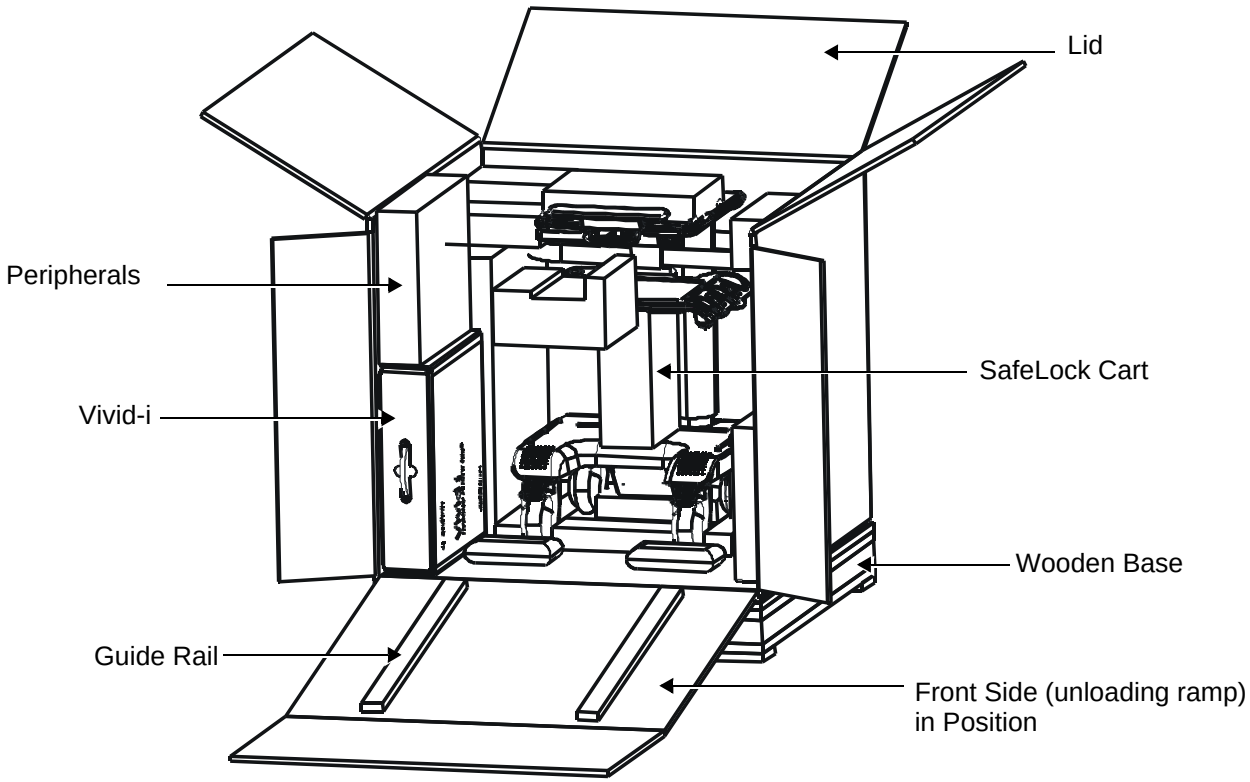


Figure 3-9 Shipping Carton with Top Open and Ramp in Position

4.) Undo the re-sealable water-proof carton liner.

5.) Remove the packing slip (shipping consignment note) detailing the contents of the shipping carton and keep close to hand ready to mark the check list - refer to Verifying the Shipping Carton Contents on page 3 - 15.

6.) Remove the surface packing material (paper pads, bubble packs, foam sections, silica gel, *etc*.). Continue to remove additional packing material as applicable during the following procedure steps.

7.) Carefully remove the box containing the peripherals and probes, as well as the package containing the following accessories: cables (AD/DC; ECG; Network), Isolation Box, and software CD.

8.) Carefully remove the box containing the Vivid-i™ scanner.

9.) Remove any additional packing material in front of and surrounding the SafeLock Cart. Using two people, carefully roll the Cart *forwards* down the unloading ramp to remove it completely from the shipping carton - see Figure 3-9 below.

CAUTION

Two people are required when moving the SafeLock Cart

This precaution is intended to prevent injury that may be caused by the weight of the machine if one person attempts to move the cart considerable distances or on an incline.

Make sure the Cart is standing firmly on the floor before applying the locking brake.

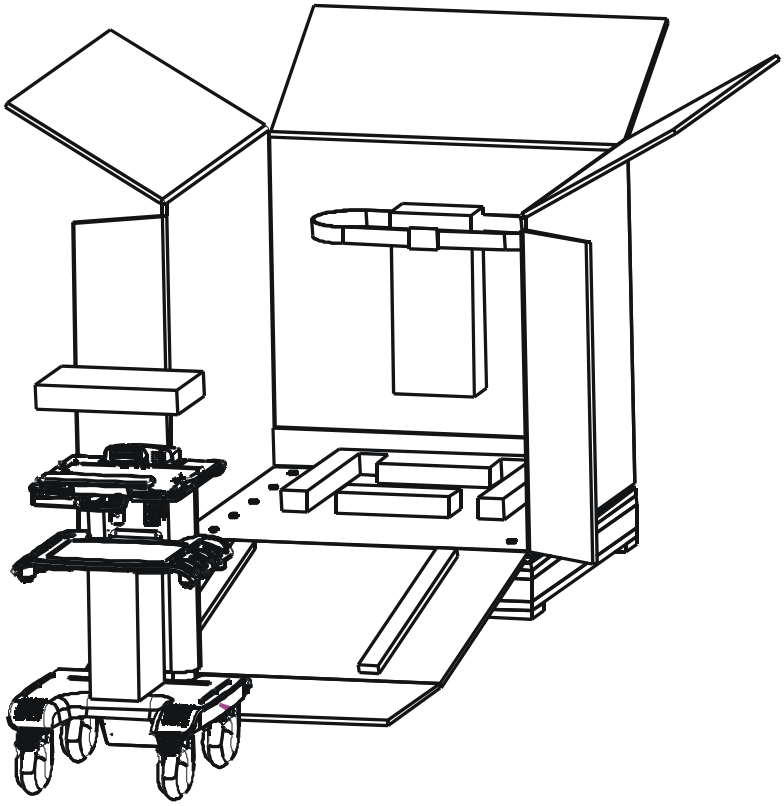


Figure 3-10 SafeLock Cart Removed from Shipping Carton

10.) Remove the foam sections from the top of the cart and from between the main shelf and probe shelf.

11.) Using the up/down handle, raise the main shelf up to appropriate height.

12.) Carefully remove the Vivid-i™ ultrasound unit from its outer carton, and then remove the unit from the two protective interleavers (upper and lower).

13.) Before commencing the installation procedure, follow the instructions for Verifying the Shipping Carton Contents on page 3 - 13.

3-3-1-2 Unpacking the Vivid-i™ with Peripherals

1.) Cut the steel straps securing the shipping carton to the wooden base - see Figure 3-6 on page 3-6.

CAUTION: When using sharp tools to open packing materials, take care to avoid cutting or damaging any of the contents.

2.) Carefully cut the adhesive tape used to close the shipping carton lid, and open the carton from the top - see Figure 3-11 below.

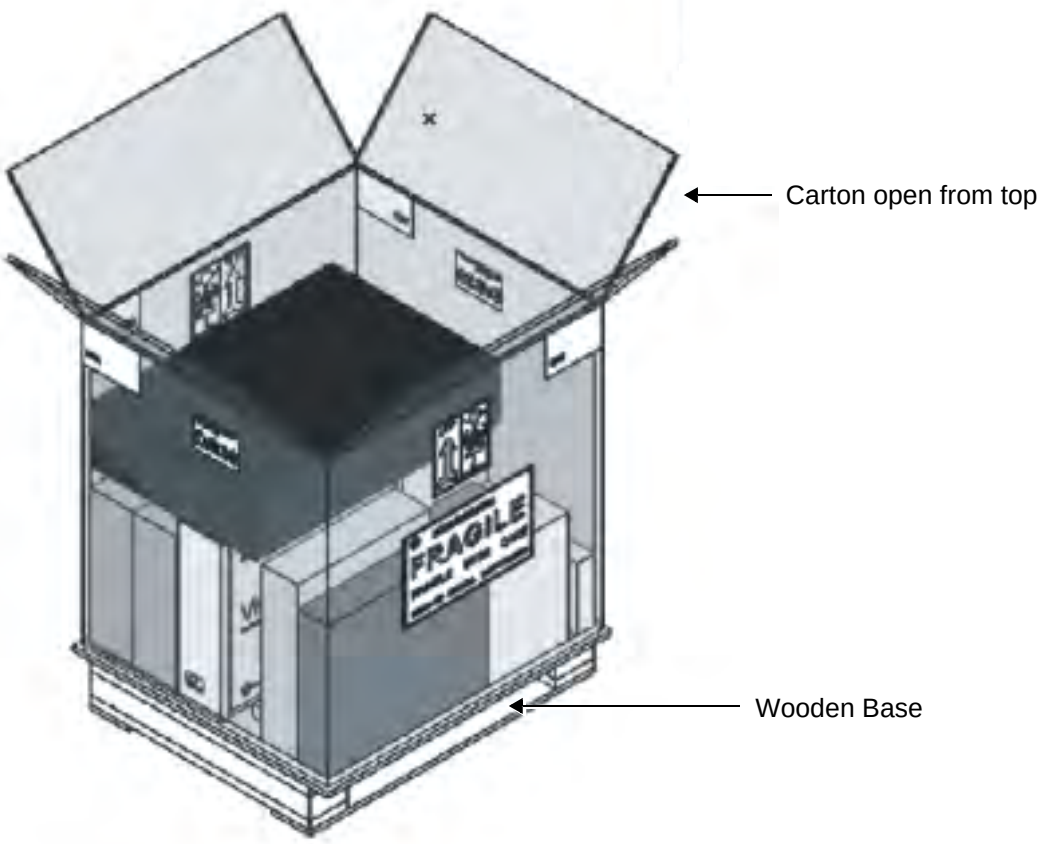


Figure 3-11 Vivid-i™ with Peripherals - Carton Open

3.) Undo the re-sealable water-proof carton liner.

4.) Remove the packing slip (shipping consignment note) detailing the contents of the shipping carton and keep close to hand ready to mark the check list - refer to Verifying the Shipping Carton Contents on page 3 - 15.

5.) Remove the surface packing material (paper pads, bubble packs, foam sections, silica gel, *etc*.). Continue to remove additional packing material as applicable during the following procedure steps.

6.) Carefully remove the box containing the peripherals and probes

7.) Carefully remove the box containing the Vivid-i™ scanner.

8.) Carefully remove the Vivid-i™ ultrasound unit from its outer carton, and then from the 2 protective interleavers (upper and lower).

9.) Before commencing the installation procedure, follow the instructions for Verifying the Shipping Carton Contents on page 3 - 13.

3-3-1-3 Unpacking the Vivid-i™ SafeLock Cart

1.) Cut the steel straps securing the shipping carton to the wooden base - see Figure 3-5 on page 3-6.

CAUTION: When using sharp tools to open packing materials, take care to avoid cutting or damaging any of the contents.

2.) Carefully cut the adhesive tape used to close the shipping carton lid, and open the carton from the top.

3.) Carefully cut the adhesive tape used to close the front side of the shipping carton, remove the five staples from each side, then drop the side *downwards* until it is resting on the floor, as shown in Figure 3-12 below.

Note: The front side of the carton is re-inforced with wooden guide rails and, when dropped down in the open position, forms a strong ramp used for wheeling out the SafeLock Cart.

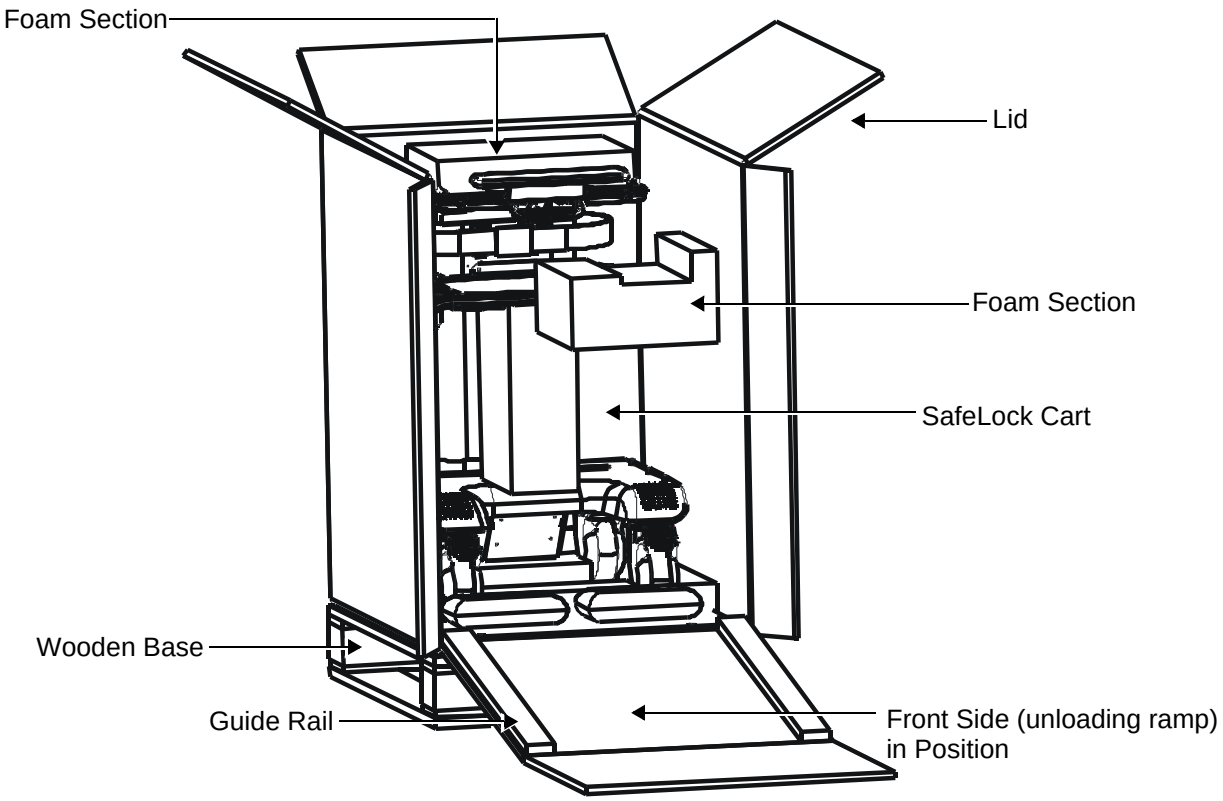


Figure 3-12 Shipping Carton with Top Open and Ramp in Position

4.) Undo the re-sealable water-proof carton liner.

5.) Remove the packing slip (shipping consignment note) detailing the contents of the shipping carton and keep close to hand ready to mark the check list - refer to Verifying the Shipping Carton Contents on page 3 - 15.

6.) Remove any additional packing material in front of and surrounding the SafeLock Cart. Using two people, carefully roll the Cart *forwards* down the unloading ramp to remove it completely from the shipping carton - see Figure 3-9 below.

CAUTION

Two people are required when moving the SafeLock Cart

This precaution is intended to prevent injury that may be caused by the weight of the machine if one person attempts to move the cart considerable distances or on an incline.

Make sure the Cart is standing firmly on the floor before applying the locking brake.

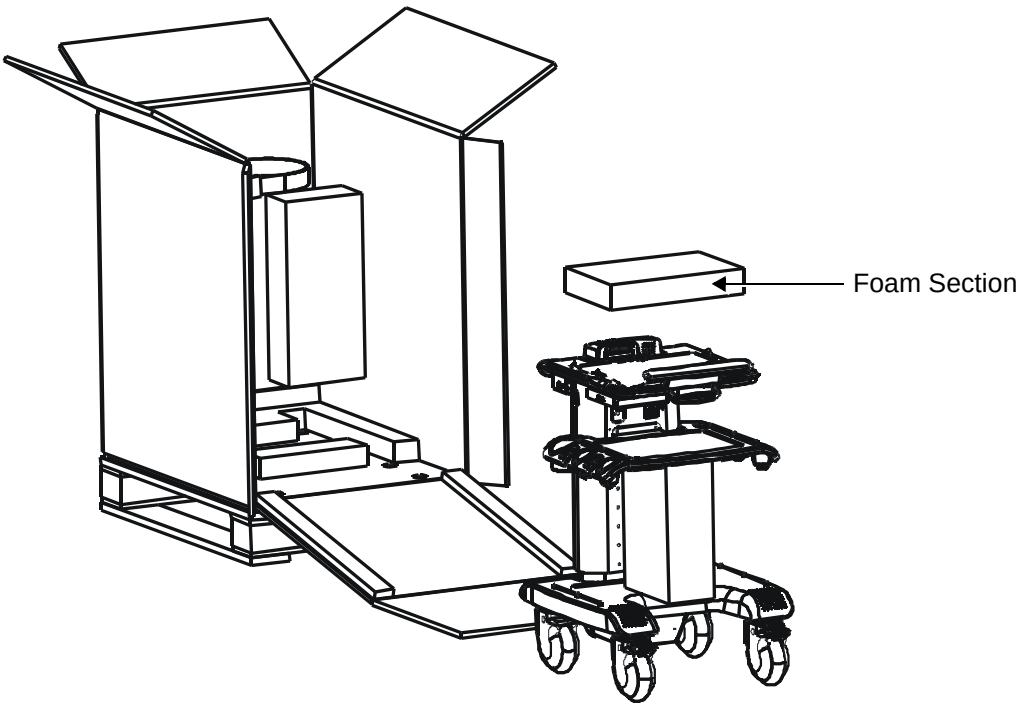


Figure 3-13 SafeLock Cart Removed from Shipping Carton

7.) Remove the foam sections from the top of the cart and from between the main shelf and probe shelf.

8.) Using the up/down handle, raise the main shelf up to appropriate height.

9.) Before commencing the installation procedure, follow the instructions for Verifying the Shipping Carton Contents, below.

3-3-2 Verifying the Shipping Carton Contents

After unpacking, it is important to verify that all items ordered by the customer have been received (refer to Verifying the Shipping Carton Contents on page 3 - 15). Compare all items listed on the packing slip (shipping consignment note) with those received and report any items that are missing, back-ordered, or damaged, to your GE Medical Systems sales representative. The contact address is shown in Contact Information on page 1 - 19.

NOTICE It is recommended to keep and store the shipping carton and all other packing materials (including the support foams, anti-static plastic cover, etc.), in case the unit (and/or SafeLock Cart) has to be moved to a different location in the future.

For warranty purposes, storage of the above is required for one year from date of purchase.

Important:

The Vivid-i™ portable ultrasound scanner is supplied from the factory with a dummy battery. When unpacking the unit, ***do not discard the dummy battery*.**

When charging the Vivid-i™ lithium ion battery on an external charger, since the battery in fact forms one of the four legs of the scanner, removing it will leave the unit standing unbalanced. For this reason, the dummy battery should be kept, so it may be inserted in position to provide stability to the scanner while the lithium ion battery is being charged.

In addition, use of the dummy battery is recommended during transportation or long-term storage of the Vivid-i™ portable ultrasound scanner.

3-3-3 Physical Inspection

3-3-3-1 System Voltage Settings

Verify that the Vivid-i™ ultrasound AC adapter and SafeLock Cart (if applicable) are set to the correct voltage. The Voltage settings are 220-240V AC - (Europe, Latin America, and China).

WARNING *Setting the* Vivid-i™ ultrasound components *to the wrong voltage setting will most likely destroy the equipment.*

3-3-4 EMI Protection

The Vivid-i™ Ultrasound Unit has been designed to minimize the effects of Electro Magnetic Interference (EMI). Many of the covers, shields, and screws are provided primarily to protect the system from image artifacts caused by this interference. For this reason, it is imperative that all covers and hardware are installed and secured before the unit is put into operation.

Section 3-4
Preparing for Installation

3-4-1 Confirming Customer Order

When preparing for installation of a Vivid-i™ system, it is important to verify that all items ordered by the customer have been received. Compare all items listed on the packing slip (shipping consignment note) with those received and report any items that are missing, back-ordered, or damaged, to your GE Medical Systems sales representative.

3-4-2 Verifying the Shipping Carton Contents

The following sections list the contents of the shipping carton that are additional to the Vivid-i™ portable ultrasound scanner. These include external accessories and probes, as well as a regional language support kit, and optional peripherals (as ordered). Ensure that all relevant components are present before completing the installation.

*NOTE: The shipping carton contains an **External Accessory Kit and Optional Peripherals Check List**. When checking the contents of the carton, make sure the Check List is completed. In the event that any items are missing, contact your local GE Medical Systems representative.*

Table 3-12 External Accessory Kit

Part Description	Country	Part No
AC Adaptor	All (except Japan)	2378947-2
	Japan	2416024-2
DVDRW	All	H45021GA
Internal Battery	All	2378963-2
Ethernet Isolation Box Assy	All	2409727
CD with Vivid-i™ system software Ver 1.0.0	All	
ECG Cable	Europe	2378938
	USA	2378938-2
Power Cable (according to country)	Europe	2412094-2
	USA	2412094
	Japan	2412094-3
	UK	2412094-4
	Switzerland	2412094-5
	Italy	2412094-6
	Portugal	2412094-7
	Brazil	2412094-8
	Australia	2412094-9
	Israel	2412094-10
	China	2412094-11
Ultrasound Transmission GEL - Bottle	All	H45531HR
650 MB CD Recordable CDR Media (SONY P/N:CDQ-74N1) x 5 (1 formatted)	All	E8001LD

3-4-2-1 Regional Language Support Kit

Table 3-13 Regional Language Support Kit

Part Description	Country or Language	Part No
Vivid-i™ Documentation CD (includes: Service Manual - English, Reference Manual - English, User Manuals - in pdf format - languages as below)	All	2412093
Vivid-i™ User Manual (according to country)	English	2378957-100
	German	2378957-108
	French	2378957-101
	Spanish	2378957-106
	Italian	2378957-101
	Portuguese	2378957-127
	Japanese	2378957-140
	Chinese	2378957-142

3-4-2-2 Optional Peripherals

The shipping carton will only contain any of the optional peripherals if they have been ordered with the Vivid-i™ system. Table 3-14 below lists all possibilities.

Table 3-14 Optional Peripherals

Part Description	Part No
VCR with Video Encoder	H45021FH
B&W Video Printer (Digital) SONY UP-D895MD	H45021FF
Color Printer SONY UP-D23MD (Digital)	H45021FG
Portable DeskJet Printer HP-450	H45021FE
USB Flash Card (memory stick [disk-on-key])	H45021G
Secondary DVD-RW/CD-RW	2417993-2
MO Drive (includes USB SCSI Adaptor)	H45021GB
MO Media 5.2GB	H45001JK
MO Media 2.3GB	H45001CY
S-VHS Video Tape	H45001PG
B&W Paper	H45001PH
Color Paper	H45001PJ
Secondary AC Adaptor	H45021BE
SafeLock Cart	H45021B
Safety Lock	H45021BD
GOPack Portability Case	H45021BA
Isolation Transformer	H45021BC
Secondary Scanning Battery	H45021BB
Secondary Hard Disk	H45021BF

3-4-2-3 Probes

The shipping carton will contain the probes that have been ordered with the system.

For a list of probes available for use with the Vivid-i™ portable ultrasound scanner, refer to Available Probes on page 3 - 50.

3-4-3 Component Inspection

After verifying that all the required parts are included in the shipping crate, inspect the system components using the checklist supplied below. In addition, ensure that all the labels described in *Chapter 1 - Introduction* are present, accurate and in good condition, and enter the serial number printed on the main label into the system installation details card, as described in *System Installation Details* on page 3-158.

3-4-3-1 Damage Inspection Checklist

Visually inspect the contents of the shipping carton for damage. If any parts are damaged or missing, contact an authorized GE Service Representative.

A *Damage Inspection Checklist* for the Vivid-i™ portable ultrasound scanner is provided in Table 3-15 below.

A *Damage Inspection Checklist* for the SafeLock Cart (optional) is provided in Table 3-16 on page 3-19.

Table 3-15 Damage Inspection Checklist - Vivid-i™ System

✔	Step	Item	Recommended Procedure
	1	Console	Verify that the system is switched OFF and unplugged. Clean the console and control panel.
	2	Control Console	Physically inspect the control console for missing or damaged items. Verify the proper illumination of all the control panel buttons.
	3	Probes	Check all probes for wear and tear on the lens, cable, and connector. Look for bent or damaged pins on the connector and in the connector socket on the unit. Verify that the EMI fingers around the probe connector socket housing are intact. Check the probe locking mechanism and probe switch.
	4	LCD Display	Clean the LCD display by gently wiping with a dry, soft, lint-free non-abrasive folded cloth. Inspect the monitor for scratches and raster burn.
	5	Fans	Verify that the system's cooling fans and peripheral fans are operating.
	6	Rear Panel	Check the rear panel connectors for bent pins, loose connections and loose or missing hardware. Screw all the cable connectors tightly to the connector sockets on the panel. Verify that the labeling is in good condition.
	7	Covers	Check that all screws are tightly secured in place, that there are no dents or scratches and that no internal parts are exposed.
	8	Peripherals	Check and clean the peripherals in accordance with the manufacturer's directions. To prevent EMI or system overheating, dress the peripheral cables inside the peripheral cover.
	9	AC DC System	Check the AC DC unit is not damaged or cracked board and verify that the output cable is properly secured.
	10	Power Cord	Check the power cord for cuts, loose hardware, tire marks, exposed insulation, or any deterioration. Verify continuity. Replace the power cord, as required.

Table 3-16 Damage Inspection Checklist - SafeLock Cart (optional)

✔	Step	Item	Recommended Procedure
	1	Probe Holders	Clean the gel wells with warm water and a damp cloth to remove all traces of gel.
	2	Peripheral Power and USB Audio Panels	Check the panel connectors for bent pins, loose connections and loose or missing hardware. Screw all the cable connectors tightly to the connector sockets on the panel. Verify that the labeling is in good condition.
	3	Covers	Check that all screws are in place, all chassis and internal covers are installed.
	4	Peripherals	Check and clean the peripherals in accordance with the manufacturer's directions. To prevent EMI or system overheating, dress the peripheral cables inside the peripheral cover.
	5	AC System	Check the AC board connectors and the associated cabling for good connection and proper insulation. Verify that the connections are secured.
	6	Power Cord	Check the power cord for cuts, loose hardware, tire marks, exposed insulation, or any deterioration. Verify continuity. Tighten the clamps that secure the power cord to the unit and the outlet plug to the cord. Replace the power cord and/or clamp, as required.
	7	Front Castors	Check that the front castors can swivel, and can be placed in the locked position by pressing the foot brake lever (lower) *down* on each castor. Check that the upper lever releases the wheel lock on each castor wheel.
	8	Rear Castors	Check that the rear castors can roll and swivel.

3-4-3-2 Front and Side View of the Vivid-i™ Ultrasound Unit

Figure 3-14 below shows the Vivid-i™ ultrasound unit components that are visible from the *front* and *side* of the ultrasound unit.

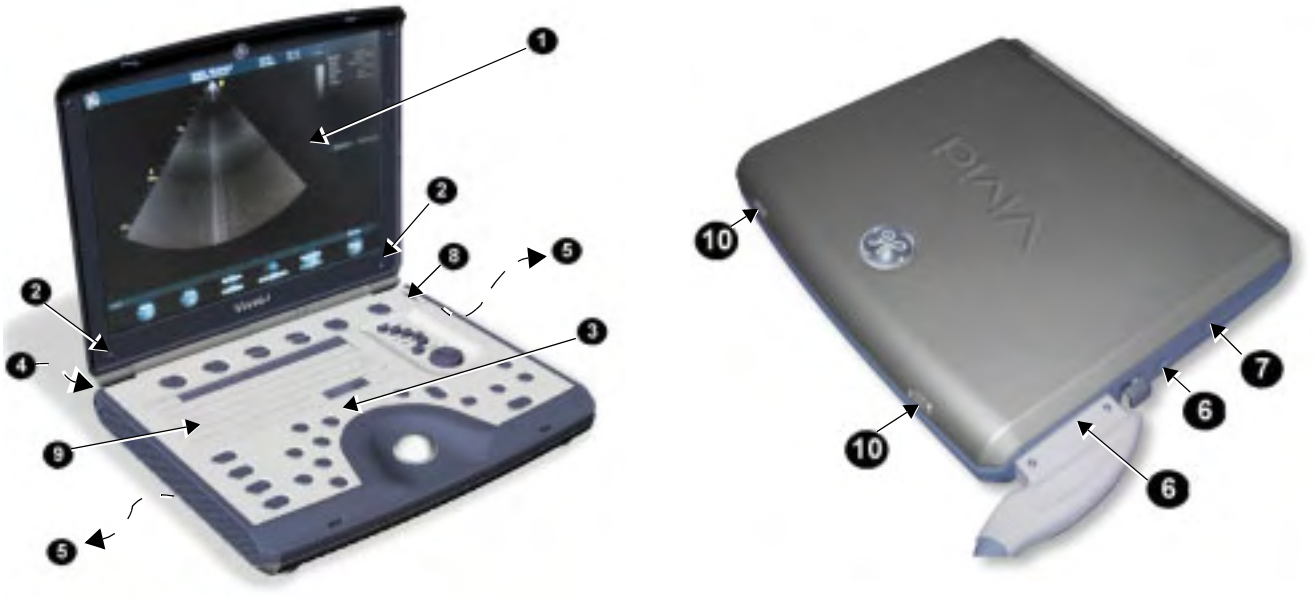


Figure 3-14 Front and Side View of the Vivid-i™

1 **Display Monitor:** tilts up and down.

2 **Speakers:** Two loudspeakers for Doppler sound

3 **Control Panel:** Contains the alphanumeric keyboard and the buttons used to operate the ultrasound unit.

4 **Rear Handle**

5 **Air Vents**

6 **Probe Ports:** Two active probe connectors (one for a pencil probe).

7 **ECG Connector**

8 **ON/OFF Switch**

9 **Alphanumeric Keyboard and Operation Button**

10 **Release Latch**

3-4-3-3 Front View of the Vivid-i™ Ultrasound Unit mounted on the SafeLock Cart

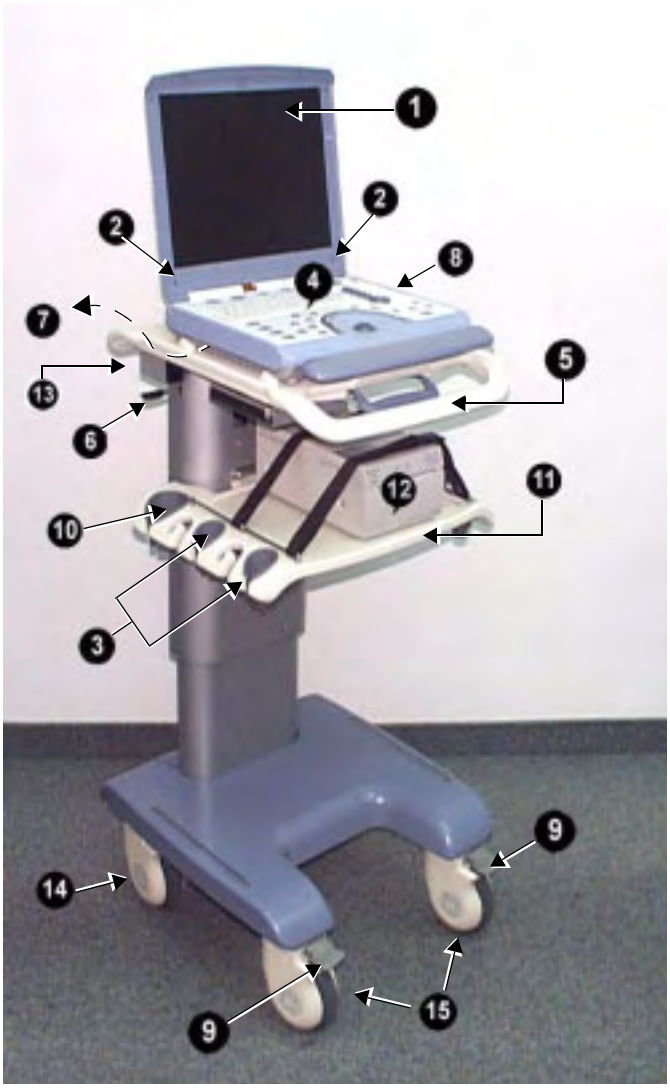


Figure 3-15 Vivid-i™ Mounted on SafeLock Cart - Front View

1 **Display Monitor:** Tilts up and down.

2 **Speakers:** Two loudspeakers for Doppler sound.

3 **Probe Holders and Probes:** Situated on either side of the front panel.

4 **Control Panel:** Contains the alphanumeric keyboard and the buttons used to operate the ultrasound unit.

5 **Front Handle**

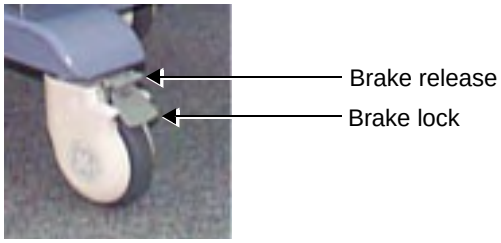
6 **Release Up/Down Handle:** Used to *raise* or *lower* the SafeLock Cart main shelf.

7 **Air Vent:** Located on the side of the system.

8 **Probe Ports:** Two active probe connectors (one for a pencil probe).

9 **Foot Brake:** Two-position brake, as follows:

- LOWER lever - ***locks*** the wheel.
- UPPER lever - ***releases*** the wheel lock.



10 **Gel Holders:** Situated on either side of the control console, and on the top surface on either side of the monitor.

11 **Storage Compartment**

Note: an additional storage compartment (optional) is illustrated in the system configuration shown in Figure 3-16 below.

12 **Peripherals:** The VCR recorder and/or black-and-white printer and/or color printer are positioned on the peripheral storage compartment/s.

13 **Cable Hook** - only seen from the rear of the SafeLock Cart

14 **Rear Castor Wheels**

15 **Front Castor Wheels**

Note: The DVD/CD Read/Write (DVD-RW, CD-RW) and MO Disk (optional) are not seen in Figure 3-15.

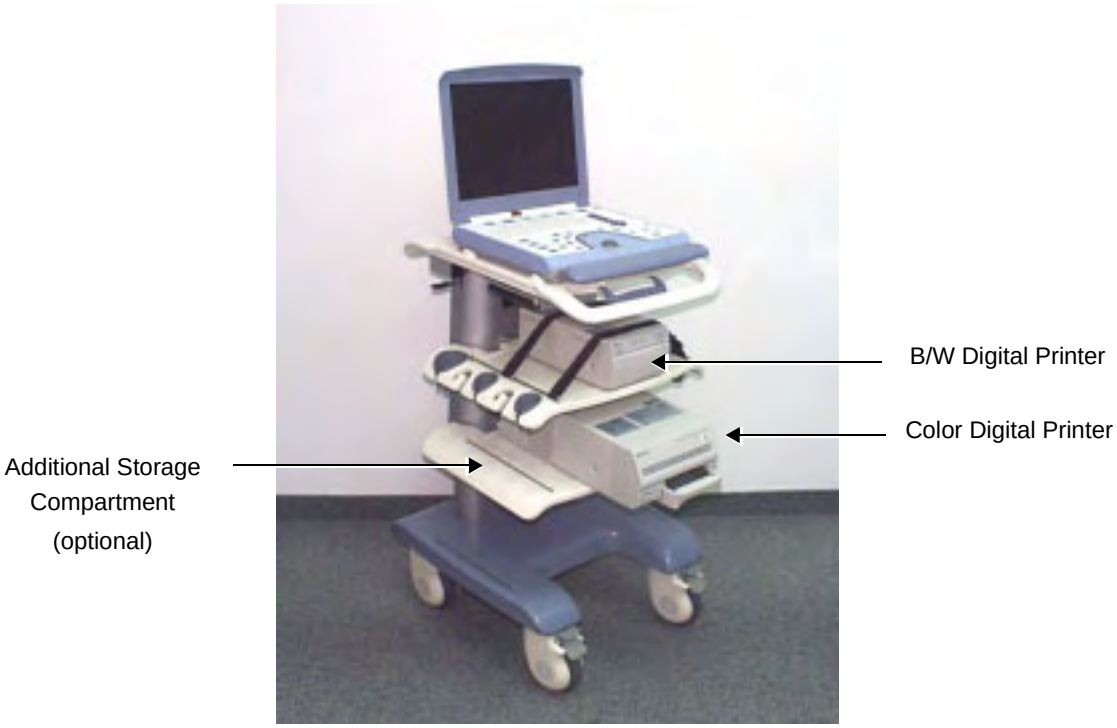


Figure 3-16 Vivid-i™ Mounted on SafeLock Cart with Additional Storage for Peripherals

3-4-3-4 Rear View of the Vivid-i™ Ultrasound Unit

Figure 3-17 shows a view of the Vivid-i™ ultrasound unit rear panel and external peripheral/accessory connectors:

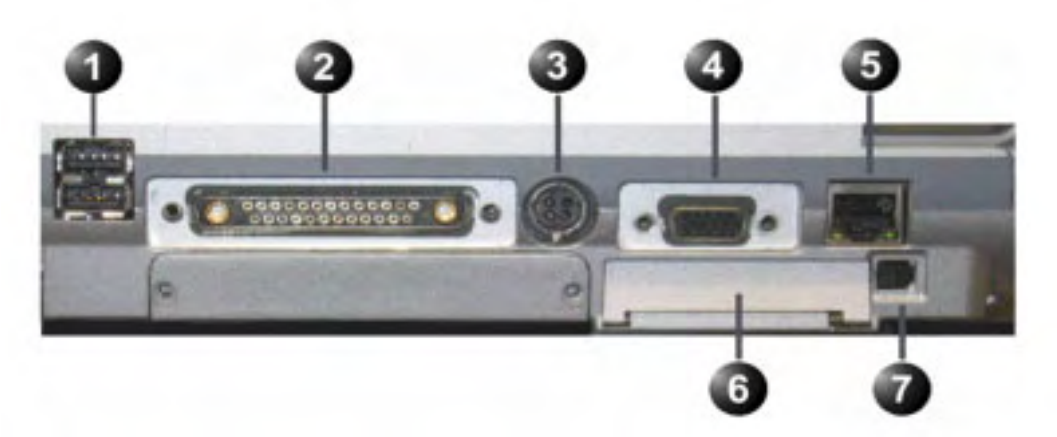


Figure 3-17 View of the Vivid-i™ Rear Panel

1 Two interchangeable USB ports (digital printer, CD-RW and other peripherals)

2 Docking connector (currently not in use)

3 Port for DC IN (AC Adapter)

4 SVGA Output (VCR option or CRT monitor option)

5 LAN 10/100 Base-TX Ethernet network connector

6 PCMCIA port for PC card.

7 Ejection lever for PCMCIA device

3-4-3-5 Rear View of the Vivid-i™ SafeLock Cart

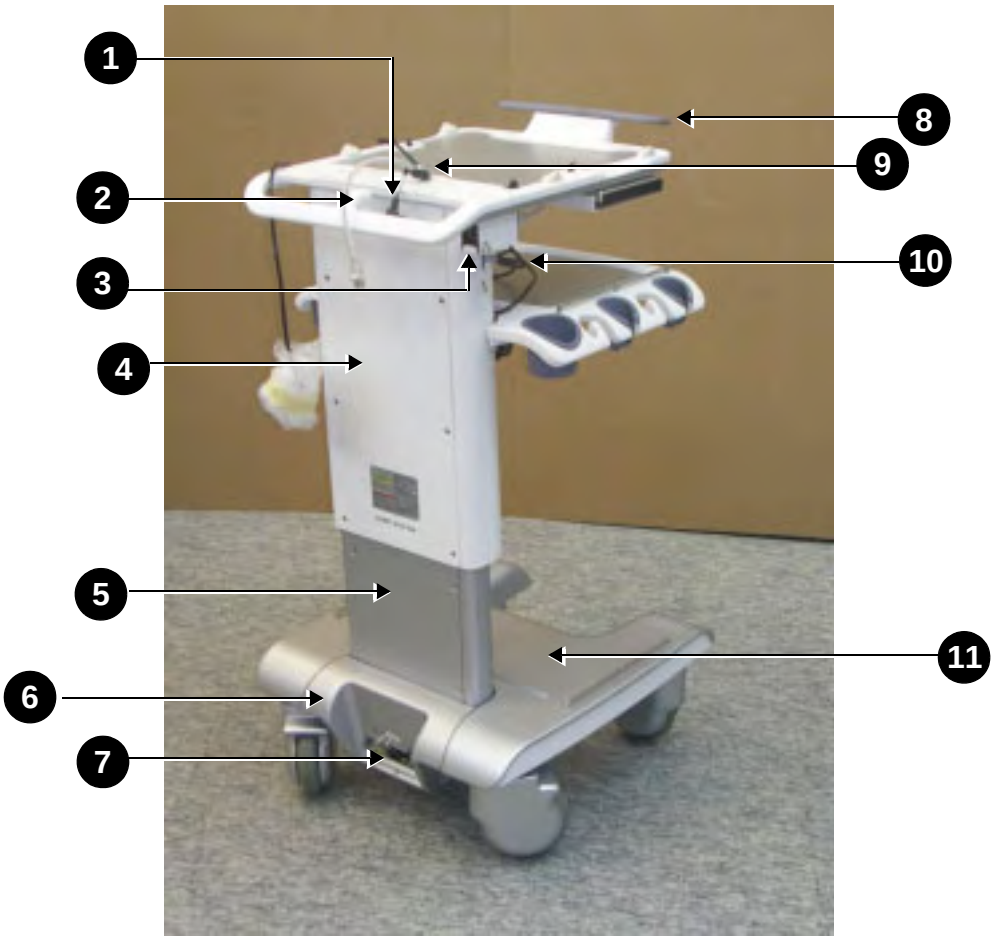


Figure 3-18 Vivid-i™ SafeLock Cart - Rear View

1 **VGA External Output**

2 **Power Cable Storage Hook**

3 **LAN Connection**

4 **Rear Upper Cover**

5 **Rear Lower Cover**

6 **Bottom Cover Rear**

7 **AC Power INPUT** (adjacent to AC Power Input but not visible in picture: Power Cable Socket, Circuit Breaker On/Off Switch, Ground Screw).

8 **Handrest Assembly**

9 **Anti-theft Lock**

10 **Release Up/Down Handle**

11 **Bottom Cover**

3-4-3-6 Side View of the Vivid-i™ SafeLock Cart

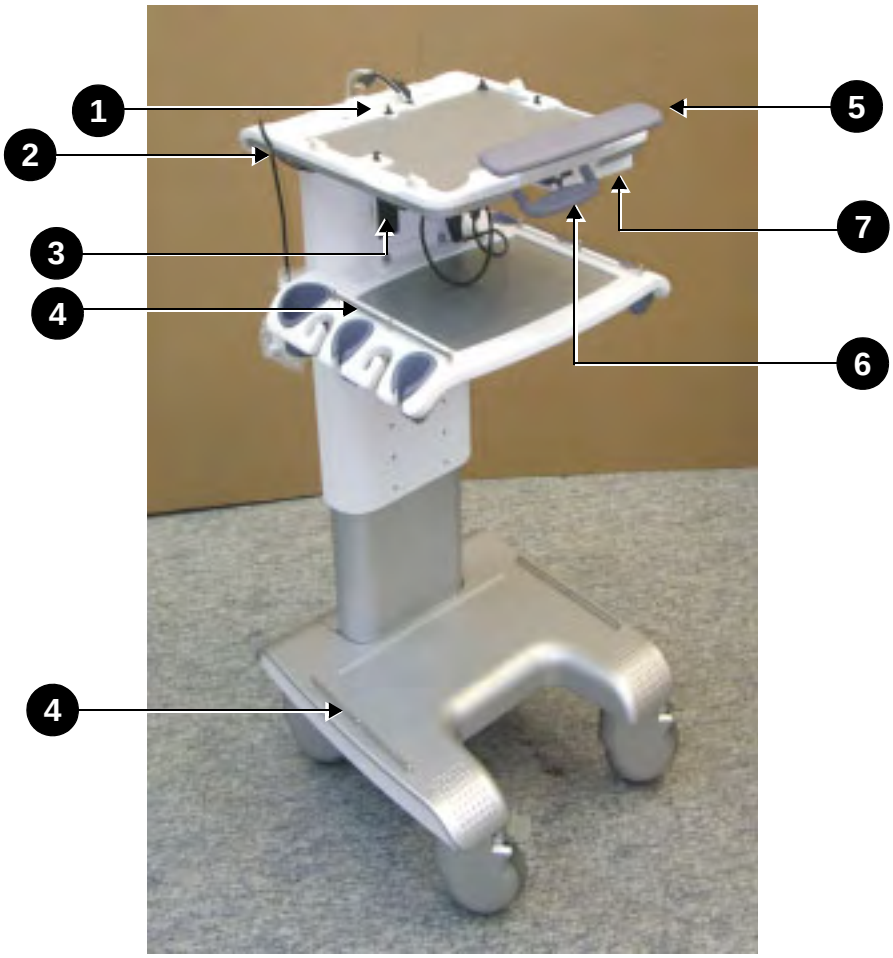


Figure 3-19 Vivid-i™ SafeLock Cart - Side View

1 **Locking Tooth**
2 **LAN Isolation Box** (not clearly visible in picture)
3 **USB/Audio Assembly**
4 **Peripheral Securing Rails**
5 **Handrest Assembly**
6 **Release Handle**
7 **CD Shelf**

3-4-4 System Voltage Confirmation

3-4-4-1 System Voltage Settings

Verify that the Vivid-i™ portable ultrasound scanner is set to the correct voltage. The Vivid-i™ voltage settings are found on the base (underside) of the system.

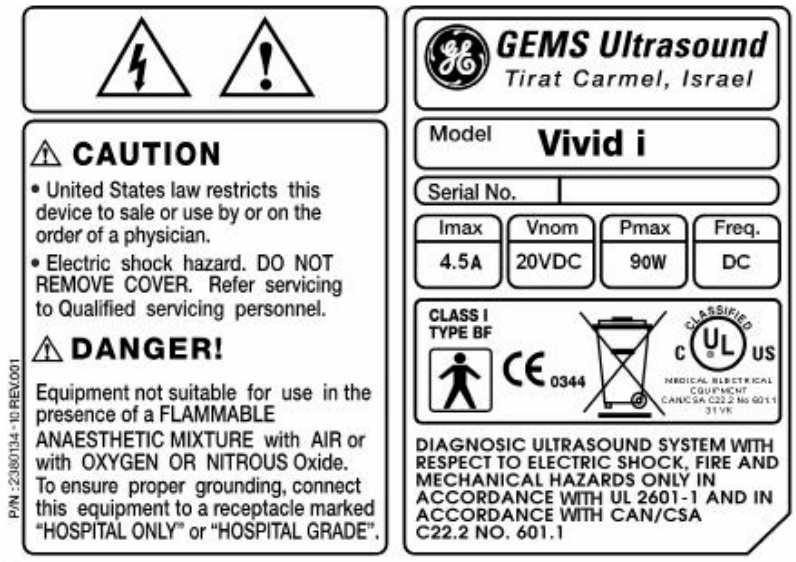

CAUTION
• United States law restricts this device to sale or use by or on the order of a physician.
• Electric shock hazard. DO NOT REMOVE COVER. Refer servicing to Qualified servicing personnel.
DANGER!
Equipment not suitable for use in the presence of a FLAMMABLE ANAESTHETIC MIXTURE with AIR or with OXYGEN OR NITROUS Oxide. To ensure proper grounding, connect this equipment to a receptacle marked "HOSPITAL ONLY" or "HOSPITAL GRADE".
P/N : 2380134 - 10 REV.001
GEMS Ultrasound
Tirat Carmel, Israel
Model Vivid i
Serial No.
Imax 4.5A
Vnom 20VDC
Pmax 90W
Freq. DC
CLASS I TYPE BF
0344
DIAGNOSIC ULTRASOUND SYSTEM WITH RESPECT TO ELECTRIC SHOCK, FIRE AND MECHANICAL HAZARDS ONLY IN ACCORDANCE WITH UL 2601-1 AND IN ACCORDANCE WITH CAN/CSA C22.2 NO. 601.1

Figure 3-20 Safety Rating Plate - Example

WARNING: Connecting the Vivid-i™ to the wrong voltage level will most likely destroy the scanner.

3-4-4-2 Confirming SafeLock Cart Voltage Configuration

NOTE: This procedure is required when using the Vivid-i™ portable ultrasound scanner with the SafeLock Cart.

1) Check the safety rating plate located at the rear of the SafeLock Cart, above AC input connector.
2) Remove the bottom cover (rear) from the SafeLock Cart to provide access to the jumper on the AC unit. See Figure 3-21 below.

Figure 3-21 Jumper on AC Unit

3.) Make sure that the jumper is set to either 100 to 120 V AC or to 220 - 240 V AC, in accordance with the voltage rating shown on the safety rating plate (step 1).

Figure 3-22 below shows the jumper removed in order to demonstrate the voltage marking.

Figure 3-22 SafeLock Cart Voltage Setting

NOTICE ***If the rating stated on the jumper does not correspond to that on the rating plate, the correct jumper must be obtained from GE Medical Systems Make Center.***

3-4-5 Ensuring Protection from EMI

The Vivid-i™ unit has been designed to minimize the effects of Electro-Magnetic Interference (EMI). Many of the covers, shields, and screws are provided primarily to protect the system from image artifacts caused by this interference. For this reason, it is imperative that all covers and hardware are installed and secured before the unit is put into operation.

Ensure that the system is protected from electromagnetic interference (EMI), as follows:

- Operate the system at least 15 feet away from equipment that emits strong electromagnetic radiation.
- Operate the system in an area enclosed by walls, floors and ceilings comprised of wood, plaster or concrete, which help prevent EMI.
- Shield the system when operating it in the vicinity of radio broadcast equipment, if necessary.
- Do not operate mobile phones or other EMI emitting devices in the ultrasound room.
- Verify that all EMI rules listed in the following table are followed:

Note: The Vivid-i™ ultrasound unit is approved for use in hospitals, clinics and other environmentally qualified facilities, in terms of the prevention of radio wave interference. Operation of the ultrasound unit in an inappropriate environment can cause electronic interference to radios and television sets situated near the medical equipment.

Table 3-17 EMI Prevention/ Abatement

EMI Rule	Details
Ground the unit.	Poor grounding is the most likely reason an ultrasound unit will have noisy images. Check the grounding of the power cord and power outlet.
Be aware of RF sources.	Keep the unit at least 5m (16.4 ft) away from other EMI sources. Special shielding may be required to eliminate interference problems caused by high frequency, high powered radio or video broadcast signals.
Replace and/or reassemble all screws, RF gaskets, covers and cores.	After you finish repairing or updating the system, replace all covers and tighten all screws. Any cable with an external connection requires a magnet wrap at each end. Install the shield over the front of the card cage. Loose or missing covers or RF gaskets allow radio frequencies to interfere with the ultrasound signals.
Replace broken RF gaskets.	If more than 20% or a pair of the fingers on an RF gasket are broken, replace the gasket. Do not turn on the unit until any loose metallic part is removed and replaced if needed.
Do not place labels where RF gaskets touch metal.	Never place a label where RF gaskets meet the unit. Otherwise, the gap created will permit RF leakage. In case a label has been found in such a location, move the label to a different appropriate location.
Use GE specified harnesses and peripherals.	The interconnect cables are grounded and require ferrite beads and other shielding. Cable length, material, and routing are all important; do not make any changes that do not meet all specifications.
Take care with cellular phones.	Cellular phones may transmit a 5 V/m signal that causes image artifacts.
Properly address peripheral cables.	Do not allow cables to lie across the top of the card cage or hang out of the peripheral bays. Loop any peripheral cable excess length inside the peripheral bays or hang on the hooks provided below the console. Attach the monitor cables to the frame.

Section 3-5
Completing the Hardware Installation

The hardware installation procedures described in this section provide instructions and information for the possible scenarios, as follows:

- Vivid-i™ scanner but no SafeLock Cart - connections direct to the system
- Vivid-i™ scanner with SafeLock Cart
- Vivid-i™ scanner but no SafeLock Cart - connections via USB hub

3-5-1 Connecting Peripherals

NOTE: All peripherals mounted on the SafeLock Cart must be firmly secured in position using the securing straps supplied with the SafeLock Cart. These straps are fastened through the metal bars located on each side of the cart and serve to hold the peripheral firmly in place.

For instructions on mounting the Vivid-i™ scanner on the SafeLock Cart, refer to *Mounting the Vivid-i™ on the SafeLock Cart (optional) on page 3 - 56.*

3-5-1-1 USB Global Modem

NOTICE **IMPORTANT During Stand-by mode, it is NOT recommended to *introduce* or *remove* USB devices; this may cause the system to lock-up during the boot-up procedure**.

The USB Global Modem connection in the different scenarios is explained below.

- **No SafeLock Cart - connection directly to the Vivid-i™ system**

The USB Global modem can be powered via the USB port on the Vivid-i™ system with no need for additional power. The modem should be connected to the *lower* USB port on the rear connectors panel.

When connecting the modem, there is no preference as to which cable to connect first. One end of the telephone cable can be connected to the wall outlet and the other side to the modem, followed by connecting one end of the USB cable to the modem and the other side to the *lower* USB port on the rear connectors panel.

All software drivers for the modem are pre-installed for the specific modem type. One must follow the i-Linq configuration procedure to complete the check-out process.

WARNING *Do not attempt to use a different type of modem either via the PC MCIA or USB ports. The ultrasound system is an extremely sensitive and complex medical system. Any unauthorized peripherals may cause system failure or damage!*

- **No SafeLock Cart - connection via USB hub**

This is not an approved configuration and, in most cases, will not work and will cause software complications.

- **Vivid-i™ mounted on SafeLock Cart**

This is not an approved configuration and, in most cases, will not work and will cause software complications.

3-5-1-2 Bluetooth Adaptor

NOTICE **IMPORTANT During Stand-by mode, it is NOT recommended to *introduce* or *remove* USB devices; this may cause the system to lock-up during the boot-up procedure**.

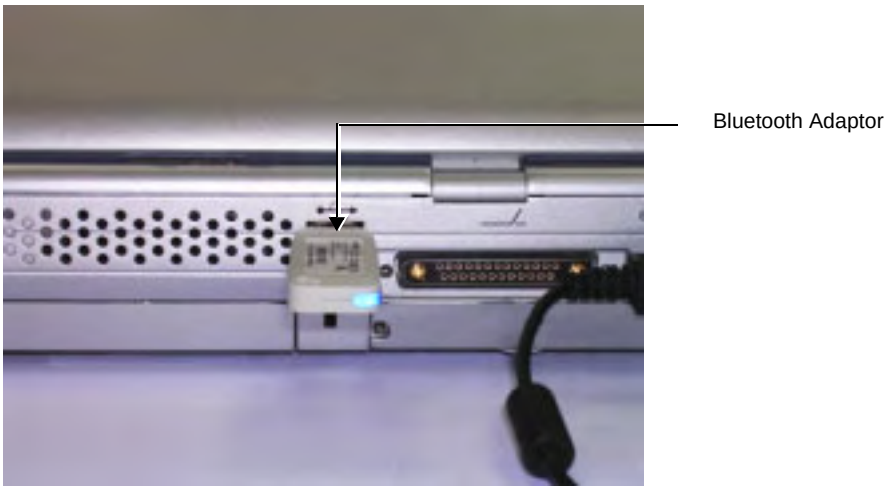


Figure 3-23 Bluetooth Adaptor Connected to the Vivid-i™

The Bluetooth Adaptor connection in the different scenarios is explained below.

- **No SafeLock Cart - connection directly to the Vivid-i™ system**

  The bluetooth adaptor should be connected to the *upper* USB port on the Vivid-i™ rear connectors panel.

  One can connect the bluetooth adaptor either once the system is powered ON, or after shutdown. All software drivers for the bluetooth adaptor are pre-configured and installed designated to be used with an HP460 portable DeskJet printer.

WARNING ***Do not attempt to use a different type of bluetooth adaptor either via the PC MCIA or USB ports. The ultrasound system is an extremely sensitive and complex medical system. Any unauthorized peripherals may cause system failure or damage!***

- **No SafeLock Cart - connection via USB hub**

  This is not an approved configuration and, in most cases, will not work and will cause software complications.

- **Vivid-i™ mounted on SafeLock Cart**

  This is not an approved configuration and, in most cases, will not work and will cause software complications.

3-5-1-3 Wireless Network Adaptor

The Wireless Network adaptor connection in the different scenarios is explained below.

- **No SafeLock Cart - connection directly to the Vivid-i™ system**

  The Wireless Network adaptor should be connected to the PC MCIA socket on the Vivid-i™ rear connectors panel.

  One can connect the Wireless Network adaptor either once the system is powered ON, or after shutdown. All software drivers for the Wireless Network are pre-installed for the designated Wireless Network adaptor only. Follow the procedure described in the Wireless Network Configuration on page 3 - 79.

WARNING ***Do not attempt to use a different type of Wireless Network adaptor either via the PC MCIA or USB ports. The ultrasound system is an extremely sensitive and complex medical system. Any unauthorized peripherals may cause system failure or damage!***

- **Vivid-i™ mounted on SafeLock Cart**

  The Wireless Network adaptor should be connected to the PC MCIA socket on the Vivid-i™ rear connectors panel. Whenever moving the system with the Wireless Network adaptor installed, make sure you do not damage the adaptor.

3-5-1-4 DVD/CD-RW Drive

NOTICE **IMPORTANT** ***By default, the DVD's AC adaptor provided is not medical grade therefore it is required to disconnect the DVD from the Vivid-i™system while scanning a patient.***
A medical grade AC adaptor may be ordered (P/N 2416318-2) in case there is a need to connect the DVD to the scanner while scanning.

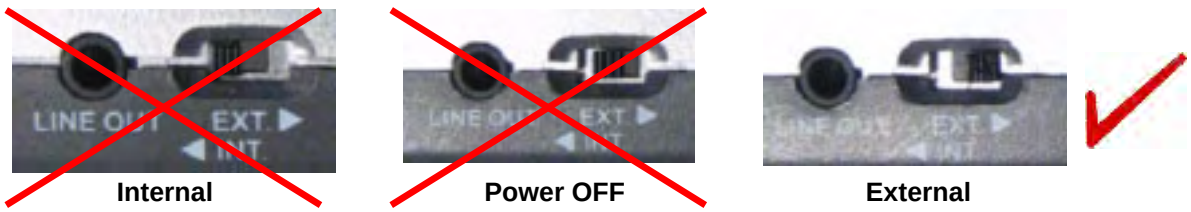
Figure 3-24 DVD/CD-RW Drive

The DVD/CD-RW drive connection in the different scenarios is explained below.

- **No SafeLock Cart - connection directly to the Vivid-i™ system or via USB Hub**

  The DVD/CD-RW Drive can be connected to either of the USB ports (*upper* or *lower*) on the rear connectors panel.

Note: The DVD/CD-RW power switch on the rear of the DVD must be set in the **External** position, as shown below:



Internal **Power OFF** **External**

When connecting directly to the system, it is necessary to use the additional power supply supplied with the DVD/CD-RW Drive.

Note: When plugging the DVD's AC adaptor directly into the mains supply, there is no insulation from leakage currents since the USB connector is not insulated. It is therefore necessary to use an isolation transformer to isolate the mains power supplied to the DVD's AC adaptor. **If an isolation transformer is not available, the DVD must be disconnected from the Vivid-i™ system while scanning a patient**.

Note: If you are replacing a DVD/CD-RW Drive and the current system software version is below 4.1.1 Build 39 (P/N 2416145-3) , it is necessary to upgrade the system to the latest software version.
The CD Software Patch 4.1.1 Build 40 P/N 2416145-4 can be obtained by ordering SW CD Kit P/N: 2415386. For instructions, refer to Software Installation/Upgrade Procedure Overview on page 8 - 74.

The DVD/CD-RW Drive can be connected once the system is powered ON, or after shutdown. All software drivers for the DVD/CD-RW Drive are pre-configured and installed designated to be used with the specific DVD/CD-RW supplied with the system.

WARNING ***Do not attempt to use a different type of mass storage device other than the DVD/CD-RW Drive supplied with the system. The ultrasound system is an extremely sensitive and complex medical system. Any unauthorized peripherals may cause system failure or damage!***

NOTICE **IMPORTANT** During software installation, the DVD/CD-RW must be connected directly to the Vivid-i™ portable ultrasound scanner and not through the SafeLock Cart or USB outlets.

NOTICE **IMPORTANT During Stand-by mode, it is NOT recommended to *introduce* or *remove* USB devices; this may cause the system to lock-up during the boot-up procedure**.

- **Vivid-i™ mounted on SafeLock Cart**

  The DVD/CD-RW data cable may be connected to any of the USB ports provided on the SafeLock cart. Additional power is supplied within the SafeLock cart; a power cable that extends out of the main column of the cart (which is provided to supply power to the DVD/CD-RW device) should be used.

  The DVD/CD-RW device is fastened into position on the SafeLock cart by way of a bracket screwed into position beneath the main shelf (see Figure 3-25 below).
  The power cable (described above) is then plugged into the rear of the DVD/CD-RW device and the data cable is connected to the USB port.

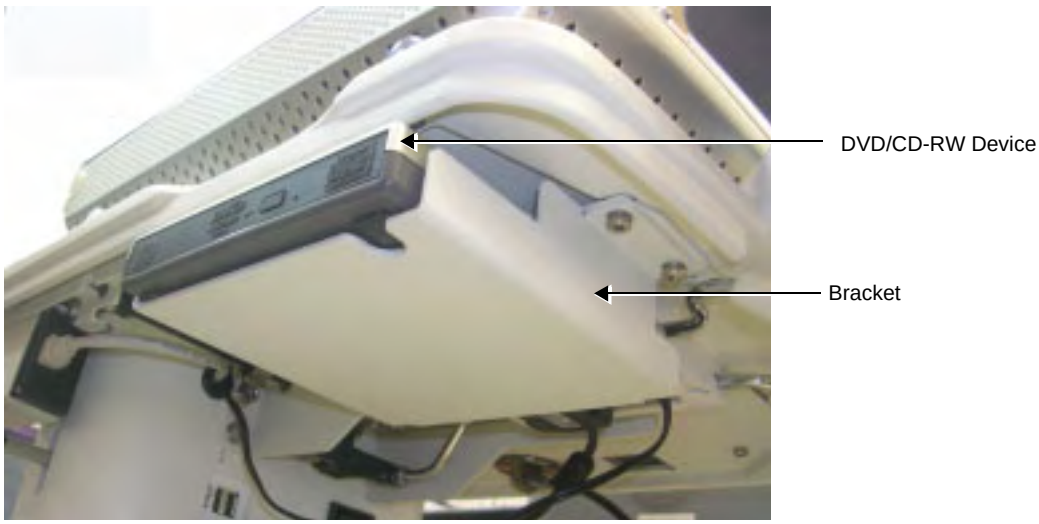


Figure 3-25 DVD/CD Device and Bracket

3-5-1-5 MOD Drive

NOTICE **IMPORTANT** ***Do not connect the MOD Drive to the Vivid-i™ system while scanning is in progress!***

NOTICE **IMPORTANT During Stand-by mode, it is NOT recommended to *introduce* or *remove* USB devices; this may cause the system to lock-up during the boot-up procedure**.

Figure 3-26 MOD Drive

The MOD drive connection in the different scenarios is explained below.

- **No SafeLock Cart - connection directly to the Vivid-i™ system**

  The MOD Drive can be connected to either of the USB ports (*upper* or *lower*) on the rear connectors panel. This connection must be via a USB-to-SCSI adaptor; one side of the adaptor being connected to the Vivid-i™ USB port, and the other side to the rear of the MOD drive.

  When connecting the MOD drive directly to the system, it is necessary to use an additional power source. **As a safety precaution, this must be done via an isolation transformer.**

  The MOD Drive may be connected once the system is powered ON, or after shutdown. All software drivers for the MOD Drive are pre-configured and installed designated to be used with the specific MOD drive supplied by GE Medical Systems.

WARNING ***Do not attempt to use a different type of mass storage device other than the MOD Drive supplied with the system. The ultrasound system is an extremely sensitive and complex medical system. Any unauthorized peripherals may cause system failure or damage!***

- **No SafeLock Cart - connection via USB hub**

  As stated above. **Safety considerations must be taken into account. The MOD Drive must be powered via an isolation transformer.** Either USB port may be used to communicate with the MOD device.

- **Vivid-i™ mounted on SafeLock Cart**

  The MOD device can be connected to any of the USB outlets provided on the SafeLock Cart. One must use the additional power source to activate the MOD Drive. However, this must be powered from the SafeLock Cart itself, via one of the isolated peripheral power outlets provided on the cart.

3-5-1-6 USB Memory Stick

NOTICE **IMPORTANT During Stand-by mode, it is NOT recommended to *introduce* or *remove* USB devices; this may cause the system to lock-up during the boot-up procedure**.

The USB Memory Stick (disk-on-key) connection in the different scenarios is explained below.

- **No SafeLock Cart - connection directly to the Vivid-i™ system**

  The USB Memory Stick may be connected to either of the USB ports (*upper* or *lower*) on the rear connectors panel.

  The USB Memory Stick can be connected once the system is powered ON, or after shutdown. All software drivers for the USB Memory Stick are pre-installed on the system. The system is capable of detecting and working with other types of memory sticks. However, it is highly recommended to use the memory stick that is provided and approved by GE Medical Systems. Other memory sticks may be sensitive to EMC interference - this may affect system performance and/or image quality.

- **No SafeLock Cart - connection via USB hub**

  As above. If applicable, the USB hub must be powered via the isolation transformer.

- **Vivid-i™ mounted on SafeLock Cart**

  As above.

3-5-1-7 Connecting the Black & White Printer

NOTICE **IMPORTANT During Stand-by mode, it is NOT recommended to *introduce* or *remove* USB devices; this may cause the system to lock-up during the boot-up procedure**.

Figure 3-27 Black and White Printer

The B/W Printer connection in the different scenarios is explained below.

NOTE: After physical connection of the printer to the Vivid-i™system, to configure the appropriate hot keys to activate printing direct from the control panel, follow the instructions in *Configuring Hot Keys to Activate Printing Direct from the Control Panel on page 3 - 37.*

- **No SafeLock Cart - connection directly to the Vivid-i™ system**

  The B/W Printer can be connected to either of the USB ports (*upper* or *lower*) on the rear connectors panel.

  When connecting the B/W Printer directly to the system, it is necessary to use an additional power source. **As a safety precaution, this must be done via an isolation transformer.**

  The B/W Printer can be connected once the system is powered ON, or after shutdown. All software drivers for the B/W Printer are pre-configured and installed designated to be used with the specific B/W Printer supplied by GE Medical Systems.

WARNING ***Do not attempt to use a different type of B/W Printer (brand or model) other than the B/W Printer provided by*** GE Medical Systems***. The ultrasound system is an extremely sensitive and complex medical system. Any unauthorized peripherals may cause system failure or damage!***

- **No SafeLock Cart - connection via USB hub**

  As stated above. **Safety considerations must be taken into account. The B/W Printer must be powered via an isolation transformer.** Either USB port may be used to communicate with the device.

- **Vivid-i™ mounted on SafeLock Cart**

  The B/W Printer may be connected to any of the USB outlets provided on the SafeLock Cart. You must use the additional power source to activate the B/W Printer. However, this must be powered from the SafeLock Cart itself, via one of the isolated peripheral power outlets provided on the cart.

3-5-1-8 Connecting the Digital Color Printer

NOTICE **IMPORTANT During Stand-by mode, it is NOT recommended to *introduce* or *remove* USB devices; this may cause the system to lock-up during the boot-up procedure**.

NOTE: After physical connection of the printer to the Vivid-i™system, to configure the appropriate hot keys to activate printing direct from the control panel, follow the instructions in *Configuring Hot Keys to Activate Printing Direct from the Control Panel on page 3 - 37.*

Figure 3-28 Digital Color Printer

The Digital Color Printer connection in the different scenarios is explained below.

- **No SafeLock Cart - connection directly to the Vivid-i™ system**

  The Digital Color Printer can be connected to either of the USB ports (*upper* or *lower*) on the rear connectors panel.

  When connecting the Digital Color Printer directly to the system, it is necessary to use an additional power source. **As a safety precaution, this must be done via an isolation transformer.**

The Digital Color Printer can be connected once the system is powered ON, or after shutdown. All software drivers for the Digital Color Printer are pre-configured and installed designated to be used with the specific Digital Color Printer supplied by GE Medical Systems.

WARNING ***Do not attempt to use a different type of Digital Color Printer (brand or model) other than the Digital Color Printer provided by*** GE Medical Systems***. The ultrasound system is an extremely sensitive and complex medical system. Any unauthorized peripherals may cause system failure or damage!***

- **No SafeLock Cart - connection via USB hub**

  As stated above. **Safety considerations must be taken into account. The Digital Color Printer must be powered via an isolation transformer.** Either USB port may be used to communicate with the device.

- **Vivid-i™ mounted on SafeLock Cart**

  The Digital Color Printer may be connected to any of the USB outlets provided on the SafeLock Cart. One must use the additional power source to activate the Digital Color Printer. However, this must be powered from the SafeLock Cart itself, via one of the isolated peripheral power outlets provided on the cart.

3-5-1-9 Configuring Hot Keys to Activate Printing Direct from the Control Panel

1.) Press **Config** (or F2).
2.) Select **Connectivity** (in the lower part of window).
3.) Select the **Additional Outputs** tab.

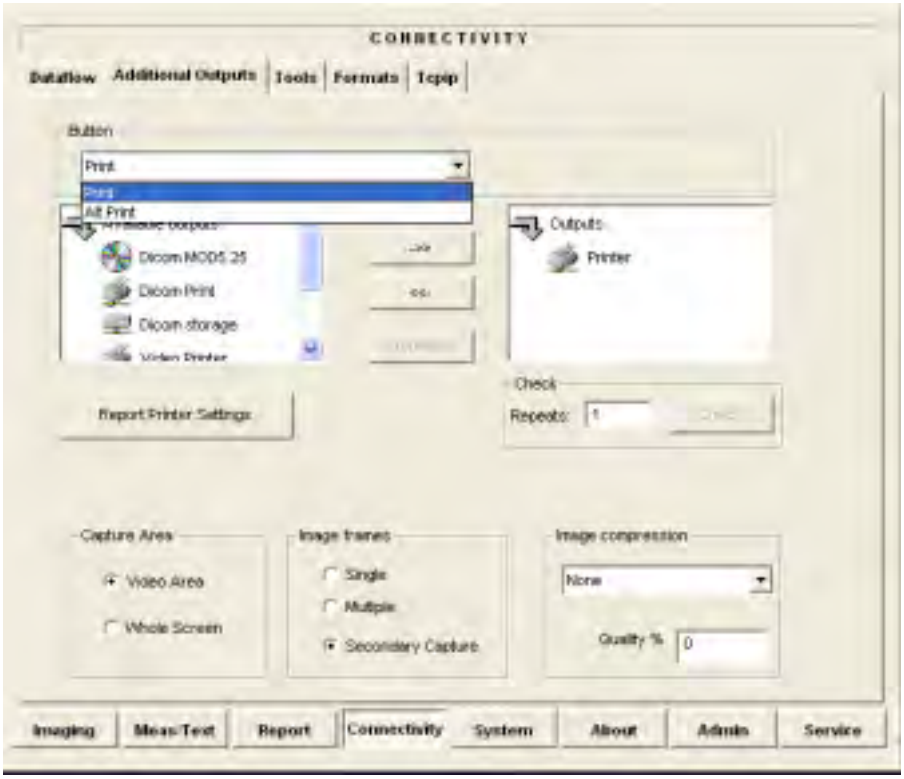


Figure 3-29 Configuring Control Panel Hot Keys for Printing

4.) From the Button drop-down menu (see Figure 3-29), select to configure either the **Print** button or **Alt+Print** to activate a variety of outputs.

5.) Use the *left* or *right* arrows below to add any of the available options (listed on the left) as **Outputs** (listed on right).

6.) From the listed **Outputs**, select (highlight) the required output, right-click and select **Properties** to configure the output device accordingly.

Printing may now be activated direct from the Vivid-i™ Control Panel, using the hot key you have configured for this purpose.

3-5-1-10 Connecting the DeskJet Color Printer

NOTICE **IMPORTANT** ***Do not connect the DeskJet Color Printer to the Vivid-i™ system while scanning is in progress!***

NOTICE **IMPORTANT During Stand-by mode, it is NOT recommended to *introduce* or *remove* USB devices; this may cause the system to lock-up during the boot-up procedure**.

Figure 3-30 DeskJet Color Printer

The DeskJet Color Printer connection in the different scenarios is explained below.

- **No SafeLock Cart - connection via Bluetooth adaptor**

  This only applies to the HP 460 model which is supplied pre-installed with the Bluetooth adaptor. The DeskJet Color Printer can be connected to an external, non-isolated power source. Refer to the Bluetooth Adaptor on page 3 - 30.

WARNING ***Do not attempt to use a different type of DeskJet Color Printer (brand or model) other than the DeskJet Color Printer provided by GE Medical Systems. The ultrasound system is an extremely sensitive and complex medical system. Any unauthorized peripherals may cause system failure or damage!***

- **Connection via LAN**

  There are a few DeskJet Color Printers that can be connected to the system via LAN - refer to Add Printer on page 3 - 69. The DeskJet Color Printer can be connected to an external, non-isolated power source.

WARNING ***Do not attempt to use a different type of DeskJet Color Printer (brand or model) other than the DeskJet Color Printer provided by GE Medical Systems. The ultrasound system is an extremely sensitive and complex medical system. Any unauthorized peripherals may cause system failure or damage!***

- **No SafeLock Cart - connection directly to the Vivid-i™ system**

  This only applies to HP 460 models which are supplied pre-installed with the appropriate software drivers. The DeskJet Color Printer can be connected to either of the USB ports (*upper* or *lower*) on the rear connectors panel.

  When connecting directly to the system it is necessary to use an additional power source. **As a safety precaution, this must be done via an isolation transformer**.

  The DeskJet Color Printer can be connected once the system is powered ON, or after shutdown.

WARNING ***Do not attempt to use a different type of DeskJet Color Printer (brand or model) other than the DeskJet Color Printer provided by GE Medical Systems. The ultrasound system is an extremely sensitive and complex medical system. Any unauthorized peripherals may cause system failure or damage!***

- **No SafeLock Cart - connection via USB hub**

  As stated above. **Safety considerations must be taken into account. The DeskJet Color Printer must be powered via an isolation transformer.** Either USB port may be used to communicate with the device.

- **Vivid-i™ mounted on SafeLock Cart**

  The DeskJet Color Printer may be connected to any of the USB outlets provided on the SafeLock Cart. One must use the additional power source to activate the DeskJet Color Printer. However, this must be powered from the SafeLock Cart itself, via one of the isolated peripheral power outlets provided on the cart.

3-5-1-11 Connecting the VCR

Figure 3-31 Video Casette Recorder

There are two types of VCR - PAL or NTSC approved by GE Medical Systems.The VCR connection in the different scenarios is explained below.

- **Direct Connection to the Vivid-i™ system**

  A Mitsubishi VCR is used in this configuration - use the type that is suited to your region. The video signal is received through a VGA-to-video converter.

1) Connect one end of the VGA cable to the VCR OUTPUT located on the Vivid-i™ rear connector panel.
2) Connect the other end of the VGA cable to the VGA INPUT on the video converter - see Figure 3-32.

Figure 3-32 Video Converter

3.) Connect one end of the S-Video cable to the S-Video OUTPUT on the video converter.
4.) Connect the other end of the S-Video cable to the VCR S-Video INPUT at the rear of the VCR.

Note: Dip switches are located beneath the video converter, as shown in Figure 3-33 below.

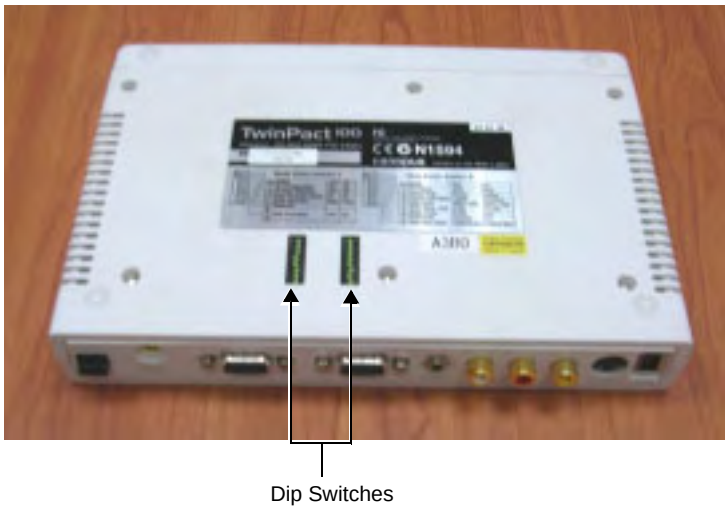


Figure 3-33 Video Converter Dip Switches

5.) Follow the manufacturer's guidelines to set the switches to the correct positions, as shown in Figure 3-34 below.

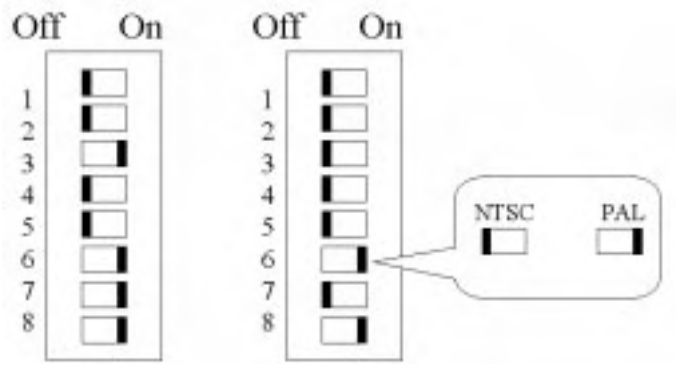


Figure 3-34 Video Converter Dip Switch Positions

6.) When all power and signal cables are connected to the system, VCR, and video converter, proceed as follows (**in the order stated**):

a.) Press the power ON switch on the VCR.

b.) Press the power ON switch on the video converter.

c.) Turn ON power to the Vivid-i™ system.

7.) Press the **Input Select** button (see Figure 3-32 on page 3-41) on the video converter *three* times in order to select VGA Input as your signal source.

The LED located on the video converter front panel will be illuminated, accordingly.

8.) Press on the three buttons <**CTRL**> <**ALT**> <**Page Erase**> simultaneously.

The following screen will appear.

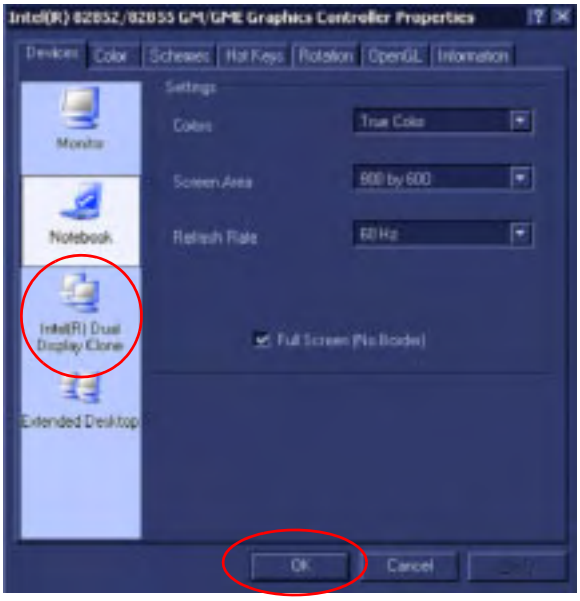


Figure 3-35 Intel® Dual Display Clone

9.) Select the **Intel® Dual Display Clone** icon and press **OK -** see Figure 3-35

NOTE: If the VGA cable is not properly connected to the rear panel, or in the event that the scan-converter device is not switched ON, you may see a single icon displayed, as shown in Figure 3-36.

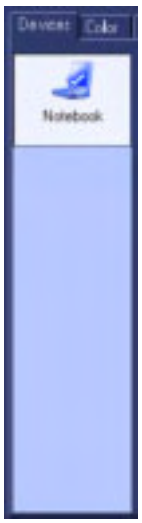


Figure 3-36 Single Icon

10.) Confirm Desktop Change by clicking **OK**.

The dialog box will be closed and the VGA output will become activated, see Figure 3-37

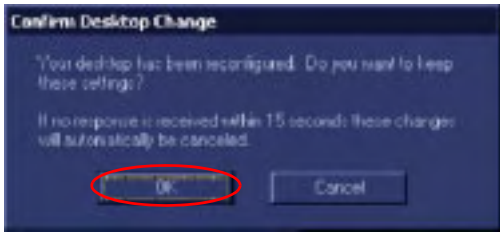


Figure 3-37 Confirm Desktop Change

NOTE: When the VGA cable is disconnected and reconnected while the system is ON, the VGA output is maintained.

NOTE: If system is shut-down to standby or Full-shut-down while the VGA device is connected continuously, the VGA output will appear after the system is turned ON

NOTE: If the system is shut-down to Standby or Full-shut-down and the VGA device is disconnected, the VGA output will not appear after power is turned ON, and the above procedure will have to be repeated.

- **Vivid-i™ mounted on SafeLock Cart**

  A Mitsubishi VCR is used in this configuration - use the type that is suited to your region. The VCR must be powered using one of the peripheral power outlets available on the cart. The video signal is received through a VGA-to-video converter, and this must also be powered through one of the peripheral power outlets available on the cart.

  It is possible to use a different type of VCR (brand and model). However, it is highly recommended to use a medical-graded VCR as this will ensure that both safety and image quality levels meet universal medical standards.

1) Connect one end of the VGA cable to the VGA OUTPUT located on the Vivid-i™ unit (refer to Figure 3-18 on page 3-24).
2.) Connect the other end of the VGA cable to the VGA input on the video converter.
3.) Connect one end of the S-Video cable to the video converter S-Video OUTPUT (refer to Figure 3-32).
4.) Connect the other end of the S-Video cable to the VCR S-Video INPUT at the rear of the VCR.

Note: Adjacent to the USB outlets on the SafeLock Cart there is an Audio OUTPUT available for recording audio on the VCR. The connection is described below.

5.) Connect one end of the Audio cable to the Audio OUPTUT located beside the USB outlets and the other side to the VCR Audio INPPUT *left* and *right* located at the rear of the VCR.
6.) Follow the manufacturer's guidelines to set the video converter dip switches to the correct positions (refer to Figure 3-34 on page 3-42).
7.) When all power and signal cables are connected to the system, VCR, and video converter, proceed as follows (**in the order stated**):
   a.) Press the power ON switch on the VCR.
   b.) Press the power ON switch on the video converter.
   c.) Turn ON power to the Vivid-i™ system.
8.) Press the **Input Select** button (see Figure 3-32 on page 3-41) on the video converter *three* times in order to select VGA Input as your signal source.

   The LED located on the video converter front panel will be illuminated, accordingly.

3-5-2 Charging the Battery

NOTE: The CH5000GE is a stand-alone desktop smart-battery charger with the added ability to recalibrate the fuel gauge when detected to be out of calibration. The charger is specifically designed to operate with the Vivid-i™smart-battery (P/N 2378963-2).

The charger is supplied in a carton containing the following items:

- CH5000 desktop charger/calibrator
- 24V 2.5A AC-adapter power supply, universal mains input
- Instruction Manual

CAUTION: Always observe the following safety precautions:

- Do not expose the charger or power supply to water or conductive liquids (this is not a sealed case).
- Do not open the charger or power supply case. There are no user-serviceable parts inside.
- Do not cover the fan exhaust or obstruct the airflow, as this will cause overheating.
- Use only the manufacturer's 24V 2.5A power supply.
- Place the charger in a cool location, away from external heat sources.
- During recalibration, the battery connector and base of the charger may become warm.

3-5-2-1 Setting up the Charger

1) Place the charger unit on a flat, level surface away from sources of heat and moisture.
2) Plug the DC connector from the power supply into the back of the charger.

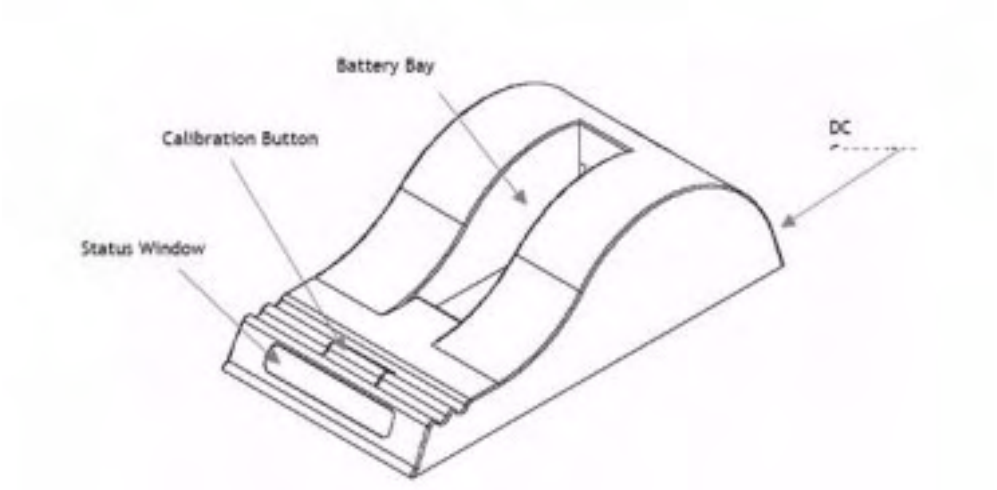


Figure 3-38 Battery Charger Unit

3.) Connect the power supply to the mains AC supply, using the cable supplied.

3-5-2-2 Charging the Battery

1) Place the battery into the battery bay making sure that the 5-way connector is fully seated.

The LEDs in the status window (see Figure 3-38) will provide status information as detailed in Table 3-18 below, and the charger will automatically begin to charge the battery.

Table 3-18 Battery Charger LED Indicators and Status

LED Indicator		Status
	Green Flashing	Battery charging
	Green Solid	Battery fully charged
	Blue flashing	Battery in Calibration mode
	Blue Solid	Battery fuel gauge calibrated
	Red Flashing	Battery fuel gauge in need of recalibration
	Red Solid	Error

- **Recharge Time**:

  The time for a full charge from 0% to 100% state of charge is typically 4.5 hours.

- **Recalibration Time**

  The recalibration cycle begins by discharging away any residual capacity. Then a calibration charge is delivered to the battery. This is followed by a calibration discharge. Finally the battery is given a regular charge. A calibration cycle will be faster if the battery is fully discharged to begin with.

  The recalibration time is approximately 9 hours for an empty battery, and approximately 14 hours for a fully-charged battery.

Note: Calibration is initiated each time the button is pressed, so it is not recommended to press the recalibration button part way through the recalibration cycle.

During the charging procedure, the green LED will be seen flashing.

At the end of this procedure, when the battery is fully charged, the solid green LED will be illuminated in the status window, indicating a fully charged battery.

2.) Remove the battery from the charger unit battery bay and install it in the Vivid-i™ portable ultrasound scanner.

Note: For more details, refer to Battery Charger on page 5 - 82.

3-5-2-3 Battery Recalibration

NOTE: For more details on recalibration and an explanation of why it is necessary, refer to Recalibration on page 5 - 83.

If the battery is in need of "fuel gauge" recalibration, the red LED will flash upon insertion of the battery. This indicator provides feedback to the user on the accuracy of the fuel gauge and avoids unnecessary battery calibration cycles.

The user has the option to calibrate the fuel gauge and charge the battery, or to only charge the battery. This option is given because a recalibration cycle is longer than a charge cycle.

1) To recalibrate the battery, press the calibrate button on the front of the battery charger unit.

   No action is required if only a recharge is required, as the charger will automatically begin to charge the battery.

   The blue calibration LED will flash to indicate that the battery is undergoing the recalibration cycle.

   There may be a short delay before the calibration begins. During calibration the discharge resistors will heat up and the fan will operate to maintain temperature within acceptable limits.

   At the end of this procedure, when the battery is fully charged and the battery fuel gauge is calibrated, the solid green and blue LEDs will be illuminated in the status window, indicating a fully charged, fully calibrated battery.

2.) Remove the battery from the charger unit battery bay and install it in the Vivid-i™ portable ultrasound scanner.

Note: The most common cause of calibration failure is overheating of the pack during discharge. For this reason, keep the charger away from direct sunlight or heat sources.

3-5-3 Connecting Probes

The Vivid-i™ ultrasound unit operates with various types of probes that are used for scanning patients, including flat phased, convex and linear electronic array probes. Once connected, the probes can be selected for different applications.

Probe connectors on the Vivid-i™ unit are as follows:

- Two active probe connectors (one for a pencil probe) on the *right* side of the unit

Probes can be connected or changed any time, as described below, regardless of whether the system is powered ON or OFF.

CAUTION: Handle the probe gently while connecting and disconnecting***.***
Do NOT touch the patient and any of the connectors on the ultrasound unit simultaneously, including ultrasound probe connectors.

1) Place the probe's carrying case on a stable surface and open the case.
2) Inspect the probe socket to verify that it is free of debris.
3) Carefully remove the probe and unwrap the probe cord.
   DO NOT allow the probe head to hang freely. Impact to the probe head could result in irreparable damage.

4) Press the probe connector locking lever *downwards* (refer to Figure 3-39).

Figure 3-39 Probe Connection Locking Lever

5) Align the connector with the probe port and carefully push into place, as shown in Figure 3-40.

Figure 3-40 Connecting Probe to the Vivid-i™

6) Press the connector locking lever *upwards* to the full vertical position to lock in place, as shown in Figure 3-41.

Figure 3-41 Securing Probe with Locking Lever

7) Carefully position the probe cord so that it is free to move and is not resting on the floor.

   When the probe is connected, it is automatically activated.

CAUTION: Do not bend the probe cable acutely.
Fault conditions can result in electric shock hazard. Do not touch the surface of probe connectors which are exposed when the probe is removed. Do not touch the patient when connecting or disconnecting a probe.

NOTE: It is not necessary to turn OFF power to connect or disconnect a probe.

3-5-3-1 Available Probes

The following probes are available for use with the Vivid-i™ ultrasound unit:

Table 3-19 Available Probes

P/N	Probe
H4000PD	3S – RS
H4000PE	7S – RS
H4000PF	10S –RS
H45531MZ	6T - RS (must have TEE Probe Interface Module [H45021D])
H45531YM	9T - RS[a]
H45021KP	TEE RS Probe Adaptor
H45021C	P2D-RS
H45021CA	P6D-RS
H40402LT	8L-RS
H40402LL	3C-RS
2354971	8C - RS[a]
5131629	4C - RS[a]
5133267	5S - RS[a]
5154514	12L - RS[a]
2290777	e8C - RS[a]

a. Must have BT06 software

3-5-4 Connecting the ECG

NOTE: The ECG may be connected to the system at any time, whether the system is powered ON or OFF.

- To connect the internal ECG carefully push the end of the cable connector into the ECG connector port (circular-shaped socket on the left side of the system beside the probe connectors), as shown in Figure 3-42 below.

Figure 3-42 ECG Cables Connected to the ECG Connector Port

CAUTION: When disconnecting the ECG Cable from the Vivid-i™, ***do not pull on the cable directly***. Carefully remove the cable by holding the outer sleeve (closest to the system) while releasing the cable.

The same connector is used both for external and internal ECG. The appropriate ECG cable kit should be ordered when external ECG is to be used.

See also information on Ext-ECG Module Connector provided in ECG Module on page 5 - 89.

Note: For optimal ECG operation, use only electrodes that meet universal standards - see Table 3-20.

Table 3-20 ECG Cable Types

Description	Part No.
Full ECG Cable Kit - AHA (Americas) Black lead (LA) White lead (RA) Green lead (RL)	**2418831-2**
Full ECG Cable Kit - IEC (Europe, Asia, ROW) Yellow lead (L) Red lead (R) Black lead (N)	**2418832-2**

3-5-5 Connecting the Unit to a Power Source

The connection of the Vivid-i™ ultrasound unit to a power source should be performed by a qualified person who has completed basic Vivid-i™ System User Training. Use only the power cords, cables and plugs provided by or designated by GE Medical Systems to connect the unit to the power source.

CAUTION: Verify compliance with all electrical and safety requirements and check the power cord to verify that it is intact and of hospital-grade before connecting the unit to the power source. Products equipped with a power source (wall outlet) plug should be connected to the fixed power socket that has a protective grounding conductor. Never use an adapter or converter to connect with a power source plug (for example, a three-prong to two-prong converter).

3-5-5-1 Voltage Level Checks

The following voltage level checks are required whenever the Vivid-i™ system is used with the SafeLock Cart:

1) Check the rating label at the rear of the SafeLock Cart, as described in *Chapter 1 - Introduction*, and verify that your local AC Voltage corresponds to the voltage setting as indicated on the rating label. The rating label indicates that the factory preset input AC voltage is one of the following:
   - 100 V - 120 V AC
   - 220 - 240 V AC
2) Verify the maximum power requirement as follows:
   - Maximum power = 250 Va (the system, SafeLock cart and peripherals might need)
   - 100 - 120 V AC, 50-60 Hz 2.5A
   - 220 - 240 V AC, 50-60 Hz 1.25A

DANGER: ***Failure to provide an adequate earth circuit (Ground) may cause electrical shock and serious injury!***

3-5-5-2 Connecting the Ultrasound Unit to the Electrical Outlet

DANGER: To avoid the risk of fire, power to the system must be supplied from a properly rated outlet. It is recommended to use a dedicated power outlet. The power plug should not, under any circumstances, be altered to a configuration rated less than that specified for the current. DO NOT use an extension cord or adaptor plug. Refer to the *Electrical Requirements* section, on page 2-3 **for more details.**

3-5-5-3 Disconnecting the Ultrasound Unit from the Electrical Outlet

CAUTION: Whenever disconnecting the Vivid-i™ unit from the electrical outlet, always observe the safety precautions. First unplug the mains power cable from the wall outlet socket, then from the unit itself. Remove by pulling on the cable connector - DO NOT pull on the cable.

1) Turn OFF power to the system.
2) Unplug the mains power cable from the AC wall outlet socket.
3) Unplug the mains power cable connector from the AC input socket on the SafeLock Cart or the AC-DC converter of the system.

3-5-6 Switching the System ON/OFF

3-5-6-1 Switching the System ON

1) Verify that the ultrasound unit has been connected to the power supply and that the circuit breaker is ON (if the system is being used on the SafeLock Cart), as described in the *Connecting the Ultrasound Unit to the Electrical Outlet* section, on page 3-52.

NOTICE When AC power is applied to the scanner, the **On/Off** button on the control console illuminates amber, indicating the Back-end Processor is in *Standby* mode.

2) Hold down the **On/Off** button on the control panel for 3 seconds. The system automatically performs an initialization sequence which includes the following:
   - Loading the operating system.
   - Running a quick diagnostic check of the system.
   - Detecting connected probes.
3) When prompted, log in to the system as appropriate.
   (Refer to the instructions for system login and user security setup as described in the Vivid-i™ User Manual).

The system first enters 2D-Mode with the probe and application that were last used before the system was shut down. If the probe has been removed since the system was last used, the currently-connected probes and their available applications are displayed and selected by default.

3-5-6-2 Switching the System OFF

NOTE: After turning OFF the system, wait at least 10 seconds before turning it on again. The system may not be able to boot-up if power is recycled too quickly.

The system can be switched OFF in one of three ways, as follows:

- Holding down the **On/Off** button for 3-5 seconds will evoke the display of the System Exit dialog box (see Figure 3-43). From this, you can either select *Full Shutdown* (click the **Shutdown** button) or choose to place the system in *Standby Mode* (click the **Standby** button).

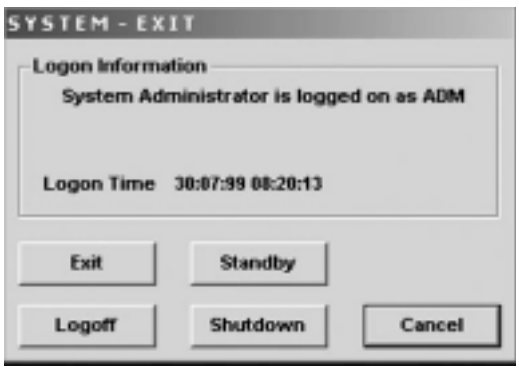


Figure 3-43 System Exit Dialog Box

- Holding down the **On/Off** button for more than 10 secs will cause the system to perform *Emergency Shutdown.* This is not recommended under normal circumstances.
- Closing the lid will place the system in *Standby Mode*.

Note: The system will remain in *Standby Mode* for as long as battery power will allow.

3-5-7 Service Dongle - Technical Support Mode

When a service dongle (technical support plug) is used, it is possible to exit into *Technical Support Mode* by either pressing the **On/Off** button for 3-5 seconds and then clicking the **Exit** button in the System Exit dialog box (refer to Figure 3-43), or by performing one of the procedures described below.

3-5-7-1 Entering Technical Support Mode During Boot-up

1) Plug the service dongle in one of the USB ports.

   During boot-up, the system detects the dongle and then displays the Maintenance Access dialog box, as shown below.

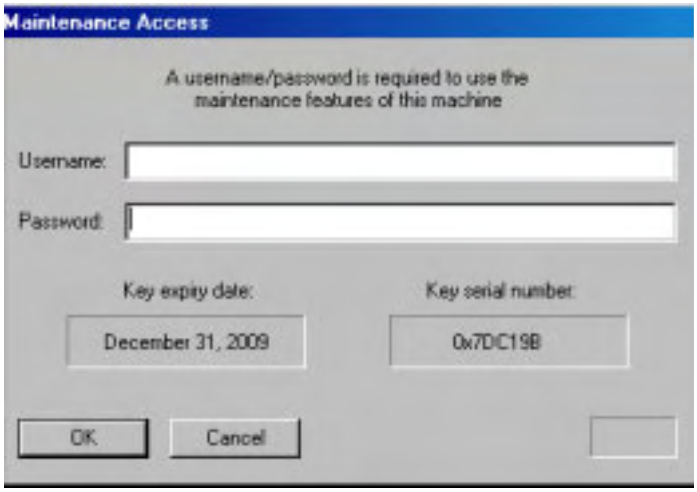


Figure 3-44 Maintenance Access Dialog Box

2) Leaving the User Name field empty, type the current GE service password in the **Password** field.

3) Click **OK**.

   The following important message is displayed:

   READ THIS NOTE BEFORE CONTINUE:
   After you have pressed OK, the Start Application dialog will be displayed on screen. Be ready to *press* MAINTENANCE... *before the Time Bar is "full", or the Vivid-i application software will be started. (A description on how to recover, if you fail to click* MAINTENANCE *is included, but you will spend extra time doing this).*

4) After reading the message, click **OK**.

   The Start Application dialog box is displayed

5.) Click the **Maintenance** button to enter *Maintenance Mode*.

The Maintenance dialog box is displayed:

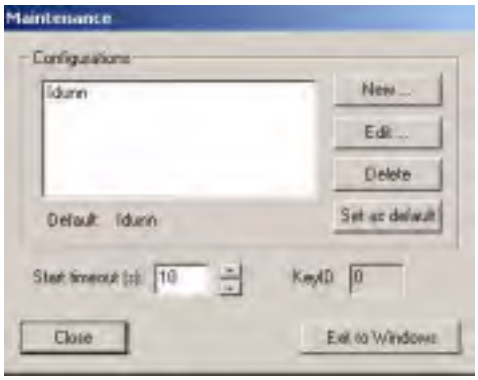


Figure 3-45 Maintenance Dialog Box

6.) Click the **Close** button.

The message "*Exit to Windows or Start?*" is displayed.

7.) Select **Start**.

The application starts and the Start Application dialog box is displayed, as shown above.

3-5-7-2 Entering Technical Support Mode when System is Powered ON - Procedure 1

NOTE: Follow these steps if you want to exit to the Windows Desktop when the Vivid-i™ application is active. The Service Dongle must be plugged in to one of the USB ports.

1.) On the Alphanumeric Keyboard, press <**Ctrl**>+**Alt**+**R**.

This will display either the Start Application dialog box (continue with step 2), or the Maintenance dialog box (continue with step 3).

2.) If the Start Application dialog box is displayed, click **Maintenance** to enter *Maintenance Mode*.

This will display the Maintenance dialog box.

3.) In the Maintenance dialog box, select **Exit to Windows**.

This will display the Windows Desktop on the screen.

3-5-7-3 Entering Technical Support Mode when System is Powered ON - Procedure 2

NOTE: The Service Dongle must be plugged in to one of the USB ports.

1.) On the Alphanumeric Keyboard, press **On/Off** button for 3-5 secs.
When System Exit dialog box appears (refer to Figure 3-43 on page 3-53), click the **Exit** button.

This will display either the Start Application dialog box (continue with step 2), or the Maintenance dialog box (continue with step 3).

2.) If the Start Application dialog box is displayed, click **Maintenance** to enter *Maintenance Mode*.

This will display the Maintenance dialog box.

3.) In the Maintenance dialog box, select **Exit to Windows**.

This will display the Windows Desktop on the screen.

Section 3-6
Mounting the Vivid-i™ on the SafeLock Cart (optional)

NOTE: The Vivid-i™ portable ultrasound scanner may be mounted on the SafeLock Cart while power to the system is either ON or OFF. When mounting the unit on the cart, it may be necessary to adjust the locking mechanism, as described in Adjusting the SafeLock Cart Locking Mechanism on page 3 - 58.

IMPORTANT ***Only the SafeLock Cart supplied by GE Ultrasound and/or any medical-grade cart which has been approved as suitable for use with the system by GE Ultrasound should be used with the Vivid-i™ portable ultrasound scanner.***

3-6-1 Mounting the Vivid-i™ on the SafeLock Cart

WARNING ***Before mounting the Vivid-i™ portable ultrasound scanner on the SafeLock Cart make sure there are no foreign objects on the main shelf surface or in front of the locking tooth.***

1) Working from the front of the SafeLock Cart, place the Vivid-i™ scanner flat down on the main shelf (towards the front) then slide it *backwards* between the sliding guides on either side of the shelf, as shown in Figure 3-46.

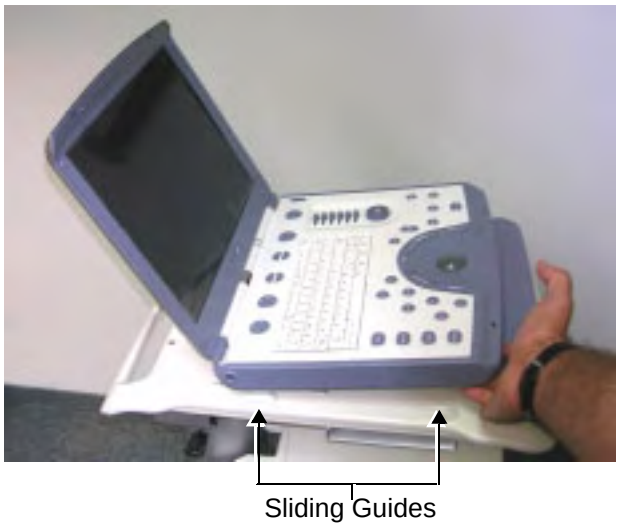


Figure 3-46 Placing the Vivid-i™ on the SafeLock Cart Main Shelf

2) Push the scanner down and *backwards*, until it locks into place against the locking tooth.

   An audible click will be heard as the scanner locks into position. There will now be a gap the width of one finger between the SafeLock Cart arm rest and the front of the scanner.

Figure 3-47 Vivid-i™ Scanner Mounted on SafeLock Cart

3) If necessary, perform the alignment procedure as described in Adjusting the SafeLock Cart Locking Mechanism, below.

4.) Connect the LAN Cable from the cart to the LAN connector on the Vivid-i™ rear panel (see Figure 3-48).

Figure 3-48 Vivid-i™ Rear Panel

5.) Connect the Docking Connector to the rear of the scanner, as shown in Figure 3-49 below.

Newer-type SafeLock Cart **Older-type SafeLock Cart**

Figure 3-49 Connecting the Docking Connector to the Rear of Scanner

6.) Connect the USB Cable from the cart to the USB port on the Vivid-i™ rear panel (see Figure 3-48). (use the *lower* port; the upper port is dedicated for the Blue Tooth connector).

7.) If necessary, connect the DVD to the USB hub on the cart - refer to page 3-29.

3-6-2 Adjusting the SafeLock Cart Locking Mechanism

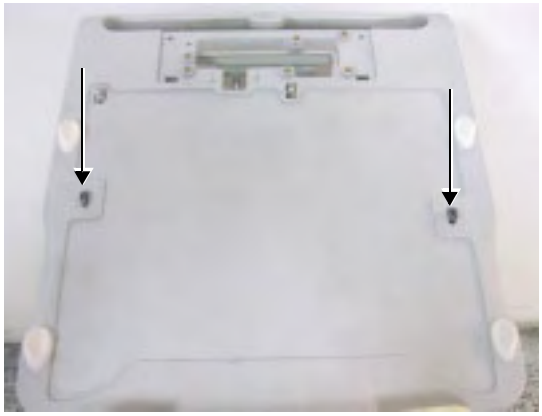
NOTE: The alignment procedure below is recommended in the event that when mounting the Vivid-i™ portable ultrasound scanner on the SafeLock Cart, the unit does not lock firmly in position when inserted into the safelocks. Alternatively, if when removing the unit from the Cart, it is difficult to disengage the safelocks.

1) Working from the *left* side of the SafeLock Cart, remove the DVD from the DVD/CD-RW device. Working from *underneath* the main shelf, loosen and remove the four screws (two each side) from the DVD/CD-RW device bracket, then remove the bracket and the device - see Figure 3-51.

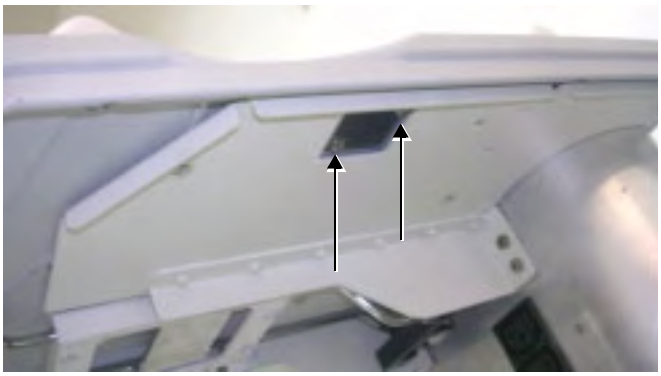
Note: only two screws visible in picture

Figure 3-50 DVD/CD Device and Bracket

2) Working from the *underneath* the main shelf, use a Phillips screwdriver to loosen the two screws (half turn counter-clockwise) holding the middle locking tooth in position on both the *left* and *right* sides of the main shelf, as shown in Figure 3-51.



Middle Locking Teeth Viewed from Top of Shelf



Screws Viewed from Beneath Shelf

Figure 3-51 Adjusting the SafeLock Cart Locking Mechanism

3.) Check that the Vivid-i™ portable ultrasound scanner is locked correctly onto the two rear locking teeth (if not, push the scanner fully back into position until an audible click is heard).

4.) Carefully tighten the four screws previously loosened in step 2.

5.) Reconfirm that the scanner is firmly locked into position and there is no excess play (movement) between the scanner and the Cart before returning the DVD/CD-RW device and bracket.

Section 3-7
Configuration

3-7-1 Overview

Table 3-21 below outlines the Vivid-i™ Configuration procedures described in the relevant sub-sections.

Table 3-21 Configuration Procedures

SUB- SECTION	DESCRIPTION	PAGE NUMBER
3-7-2	Vivid-i™ Configuration	3-59
3-7-2-2	Enter Location	3-60
3-7-2-3	Date and Time Adjustments	3-61
3-7-2-4	Language Selection	3-62
3-7-2-5	Units of Measure	3-63
3-7-3	Service Screen Set-up	3-64
3-7-4	Configuring Peripherals	3-70
3-7-4-1	Approved Peripherals	3-70
3-7-4-2	Network Peripherals (Optional)	3-70
3-5-3-1	Available Probes	3-50
3-7-5	Software Options Configuration	3-73

3-7-2 Vivid-i™ Configuration

3-7-2-1 Preparations

Press **CONFIG** (**F2**) and log on as *Adm* (see Log On to the System as ADM on page 4 - 11).

3-7-2-2 Enter Location

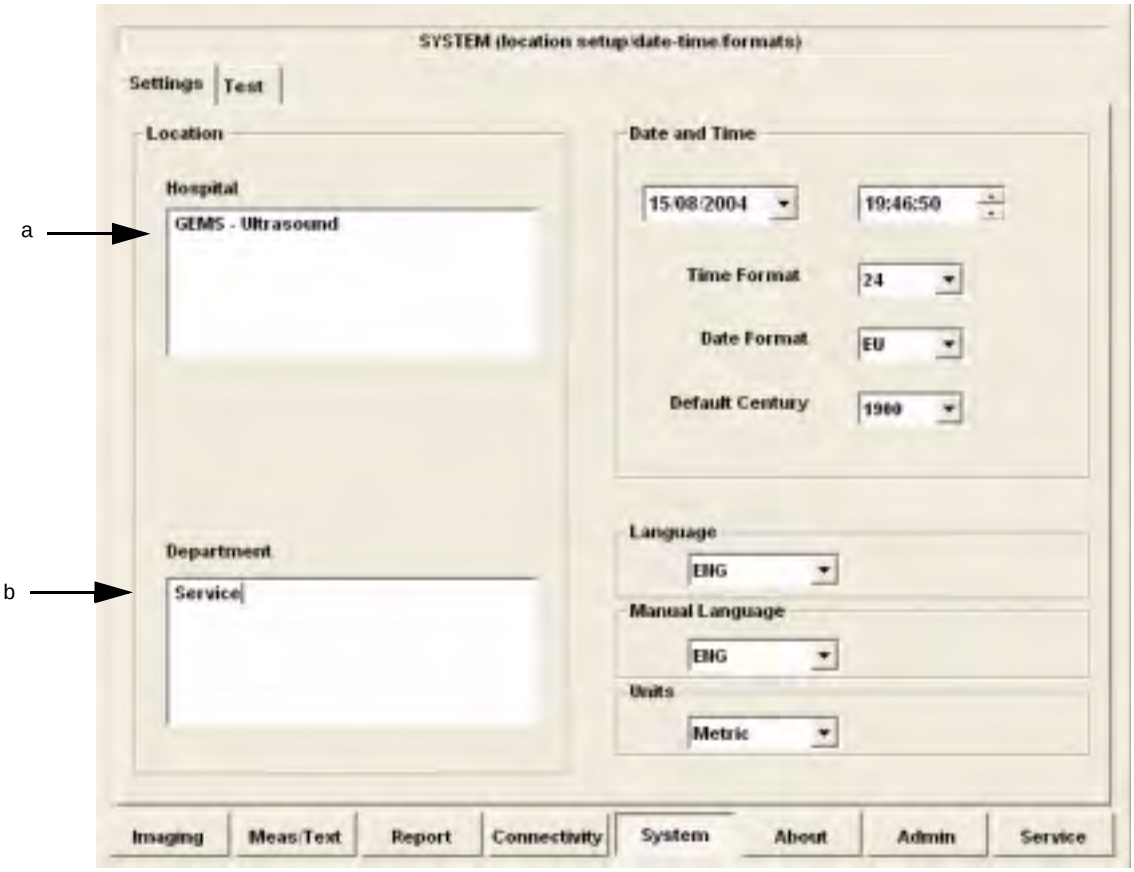


Figure 3-52 Hospital and Department Name

Table 3-22 Location Name

Step	Task	Expected Result(s)
1.	Open the Configuration Window, see Preparations. If needed, select SYSTEM.	*The System Settings Window is displayed.*
2.	Select the Hospital field, see (a) in Figure 3-52, and type the name of the hospital (max 64 characters).	The 24 first characters of this name are displayed on the scanning screen's title bar (after restart) All 64 characters are displayed on the image properties on saved images (after restart).
3.	Select the Department field, see (b) in Figure 3-52, and type the name of the department (max 64 characters).	This name will be displayed on the image properties on saved images as soon as the unit has been restarted.

3-7-2-3 Date and Time Adjustments

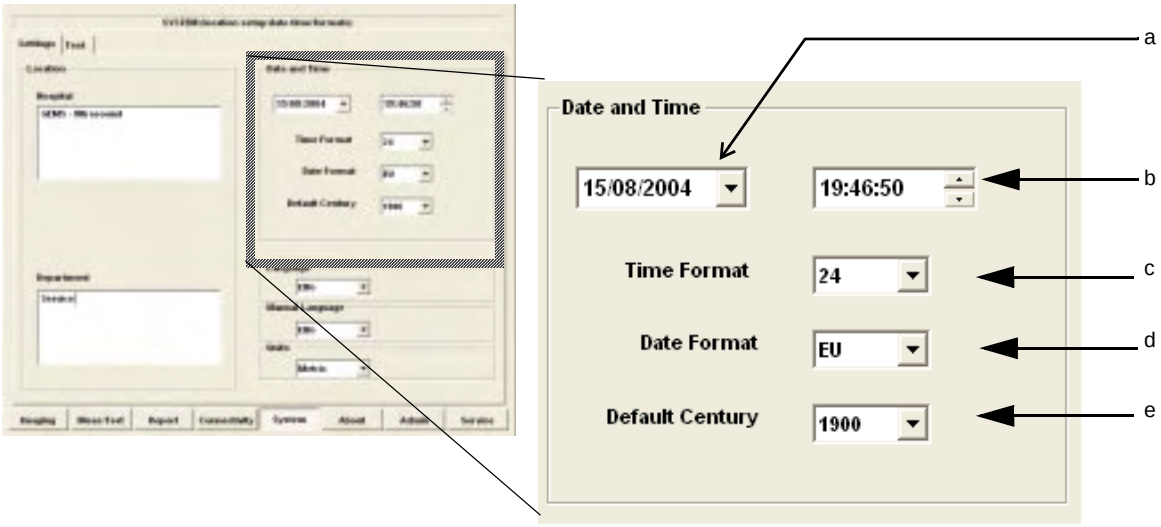


Figure 3-53 Date and Time Adjustments

Table 3-23 Date and Time Adjustments

Step	Task	Expected Result(s)
1.	Open the System (Configuration) Window, see Figure 3-52 on page 3-60. Select **SYSTEM**, if needed.	*The System Settings Window is displayed.*
2.	Adjust the date, see (a) in Figure 3-53.	New date is displayed
3.	Adjust the time, see (b) in Figure 3-53.	New time is displayed
4.	Select the preferred Time Format, see (c) in Figure 3-53.	**24:** the 24 hour format is used **12**: the 12 AM/PM hour format is used
5.	Select the preferred Date Format, see (d) in Figure 3-53. DD = Date (two digits) MM = Month (two digits) YYYY = Year (four digits)	**EU:** the European “DD.MM.YYYY” format is used **US:** the American “MM.DD.YYYY” format is used
6.	Select Default Century (1900, 2000 or None), see (e) in Figure 3-53.	**1900:** the number **19** is automatically displayed when entering the year in the patient date of birth. To edit century, press **BACKSPACE** twice. **2000:** the number **20** is automatically displayed when entering the year in the patient date of birth. To edit century, press **BACKSPACE** twice. **None:** the four digits have to be typed when entering the year in the patient date of birth. The selected setting will be used as soon as the unit has been restarted.

3-7-2-4 Language Selection

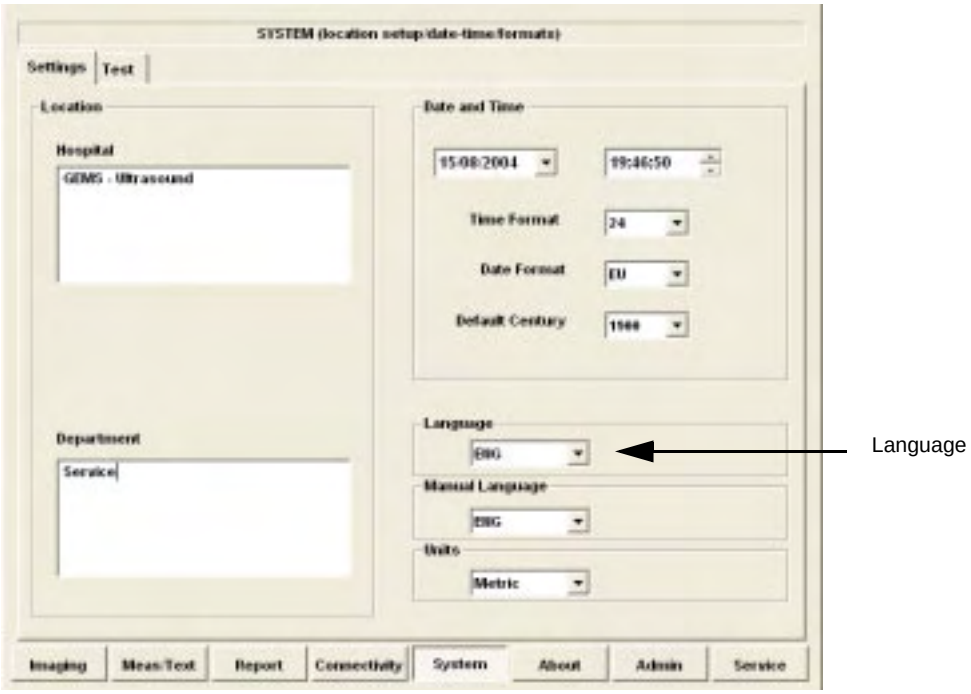


Figure 3-54 Language Selection

Table 3-24 Language Adjustments

STEP	TASK	EXPECTED RESULT(S)
1.	Open the Configuration Window, see Log On to the System as ADM on page 4 - 11. Select **SYSTEM**, if needed.	*The System Settings Window is displayed.*
2.	Use the Language drop down dialog, see Figure 3-54, to select your preferred language for the on-screen interface. The following languages are available; - ENG - English - NOR - Norwegian - DEU - German - ITA - Italian - FRA - French - ESP - Spanish - RUS - Russian - GRE - Greek - DAN - Danish - SWE - Swedish	The selected language will be used as soon as the unit has been restarted.

3-7-2-5 Units of Measure

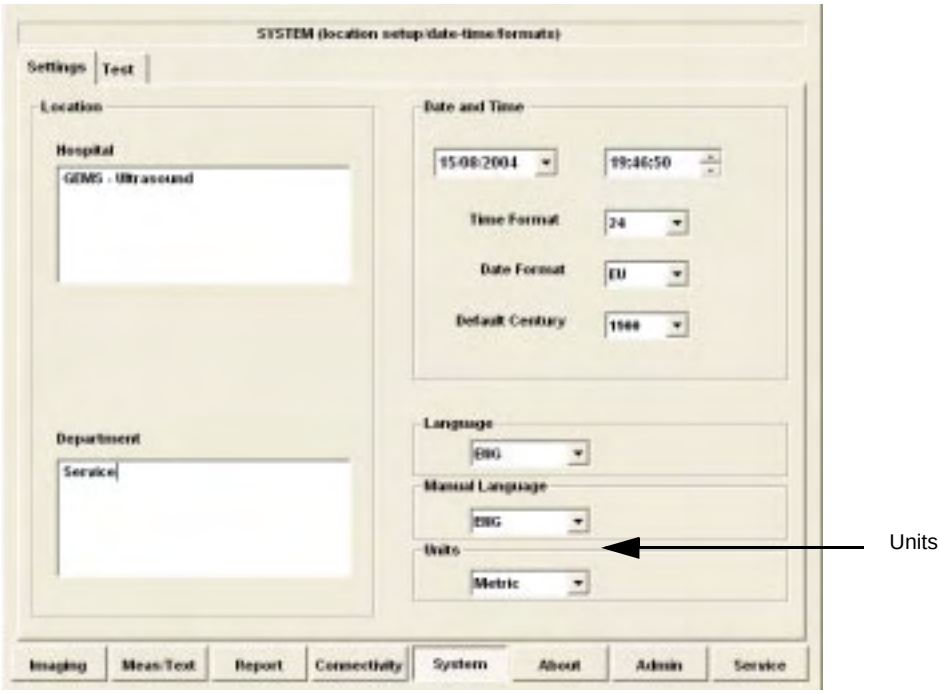


Figure 3-55 Select Units of Measure

Table 3-25 Select Units of Measure

STEP	TASK	EXPECTED RESULT(S)
1.	Open the Configuration Window, see Log On to the System as ADM on page 4 - 11. Select SYSTEM, if needed.	*The System Settings Window is displayed.*
2.	Use the drop down Units dialog (see Figure 3-55) to select Metric or US Units.	The selected units (Metric or US) will be used for measurements as soon as the unit has been restarted.
3.	Restart the scanner.	All the changed settings will be used after the restart.

3-7-3 Service Screen Set-up

3-7-3-1 Overview

The Service Screen gives you access to:

- Select Video Format to be used by the VCR
- Select the VCR type
- Adjust LCD Display Contrast and Backlight Intensity
- Keyboard Setups
- Printer Setup

3-7-3-2 Open Service Screen

1.) Press **CONFIG** (**F2**) and log on as Adm, see *Log On to the System as ADM* on page 4 - 11.
2.) Select SERVICE to view the Service Screen, see Figure 3-56 below.

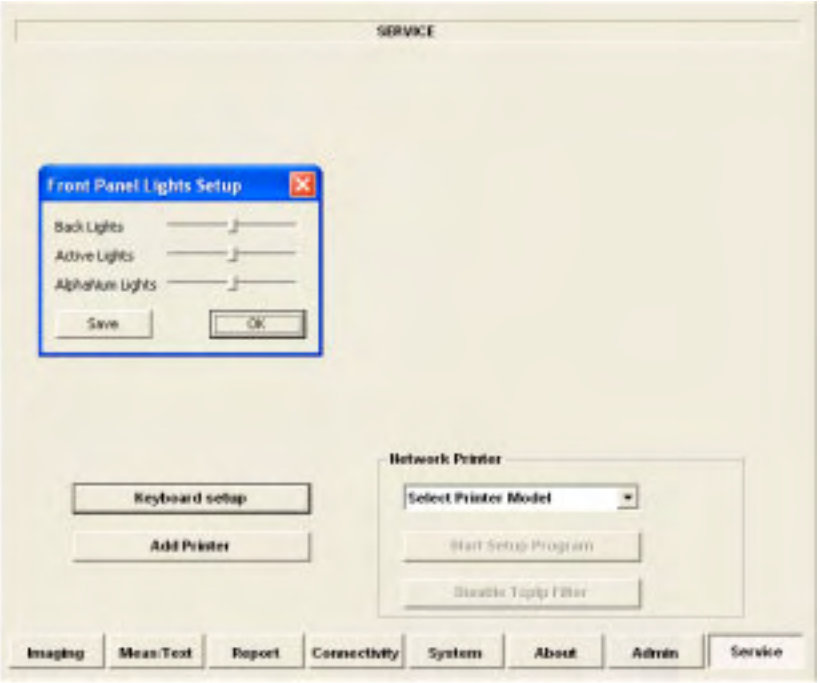


Figure 3-56 Service Screen (Example)

3-7-3-3 Adjust Keyboard Backlight Intensity

- Press <**CTRL**> + **L**.
- Use the sliders in the *Front Panel Lights Setup* dialog box to adjust **Backlight Intensity** of the Alphanumeric keyboard, Extended ultrasound keyboard, and/or Active keys, as required.

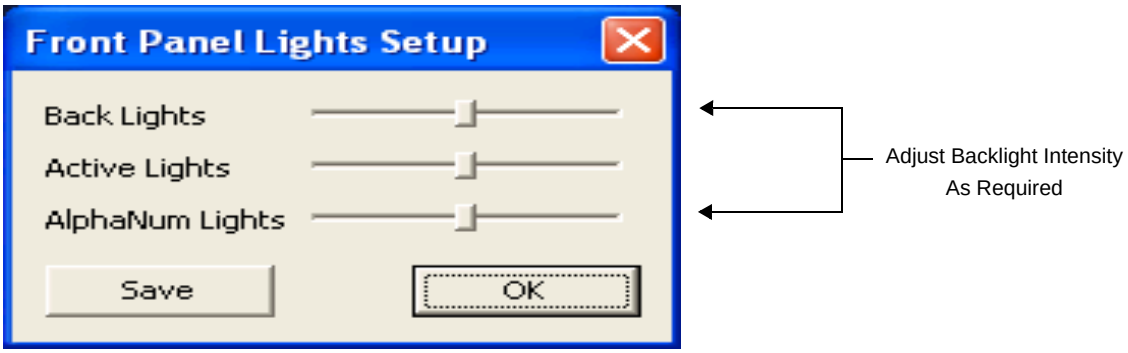


Figure 3-57 Keyboard Light Intensity Adjustment

3-7-3-4 LCD Display Adjustment and Calibration

Adjustments may be made to the LCD Display, to control and calibrate the *Contrast*, *Brightness*, and/or *Blue Tint* settings, as required.

For instructions, see LCD Display Adjustments and Calibration on page 6 - 1.

3-7-3-5 Keyboard Setup

1) Press <F2>, select Service Tab. The Select **Keyboard Setup** dialog is displayed.

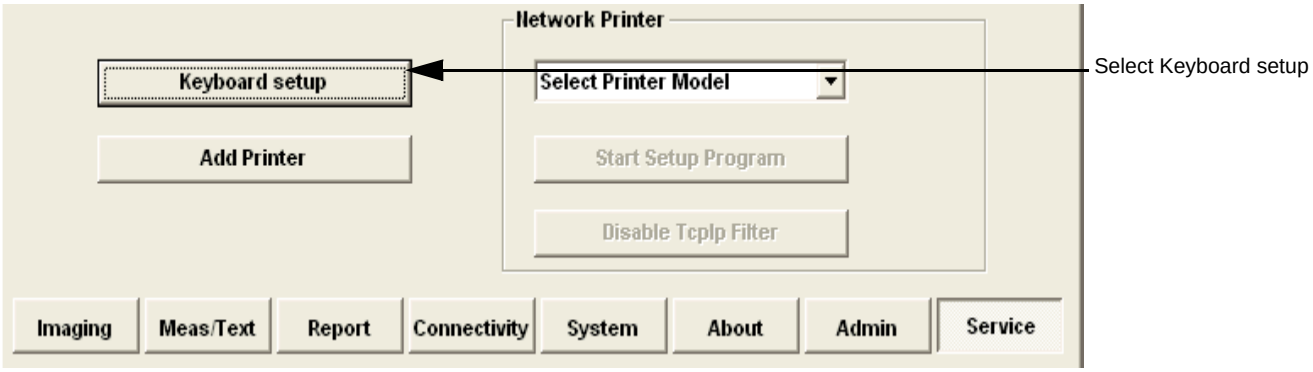


Figure 3-58 Select Keyboard Setup

2) Click **Keyboard Setup**.

The Regional and Language Options dialog box is displayed, which has controls for the following, described below:

- Regional Options - affects regional formatting of numbers, dates, times, etc.
- Languages - enables selection of the required language and methods used to enter text.
- Advanced - enables non-Unicode programs to display menus and dialogs in their native language.

3-7-3-5-1 Regional Options

- Select appropriate Format and Location, then click **Apply.**

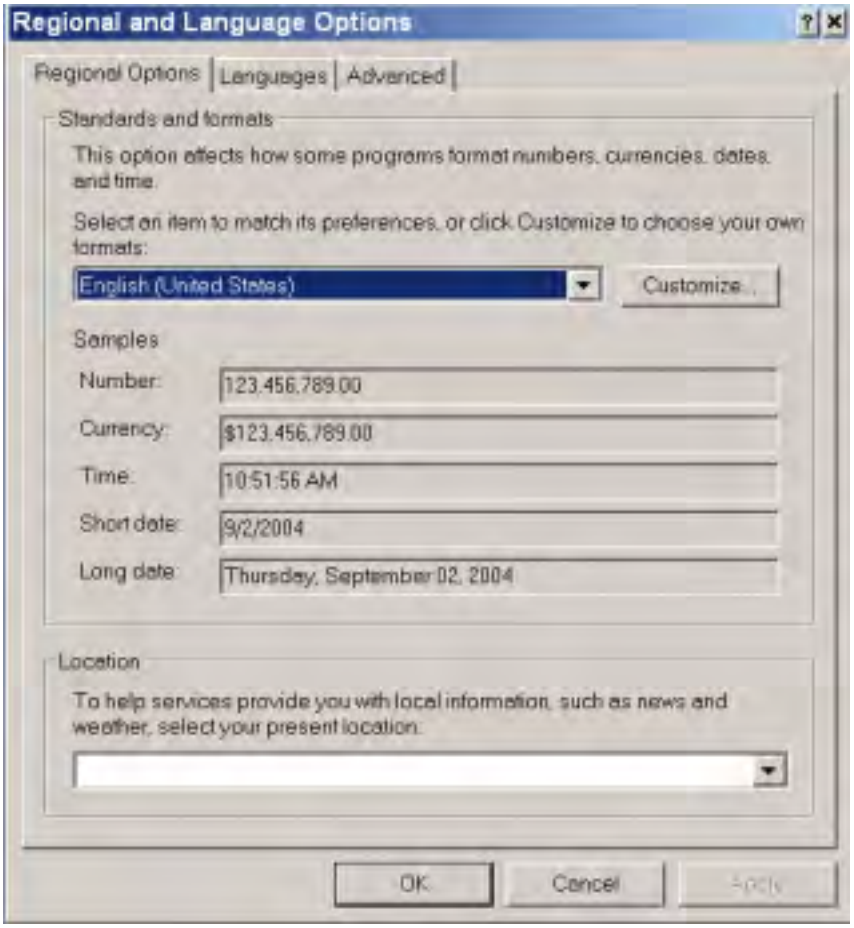


Figure 3-59 Regional Options

3-7-3-5-2 Languages

1.) Under the Languages tab, click **Details** to select appropriate Language.

2.) If necessary, activate applicable Supplemental Language Support check box, then click **Apply.**

Regional and Language Options
Regional Options
Languages
Advanced
Text services and input languages
To view or change the languages and methods you can use to enter text, click Details.
Details...
Supplemental language support
Most languages are installed by default. To install additional languages, select the appropriate check box below.
Install files for complex script and right-to-left languages (including Thai)
Install files for East Asian languages
OK
Cancel
Apply

Figure 3-60 Languages

3-7-3-5-3 Advanced

1.) Under the Advanced tab, select a language version of the non-unicode programs you want to use, then click **Apply**.

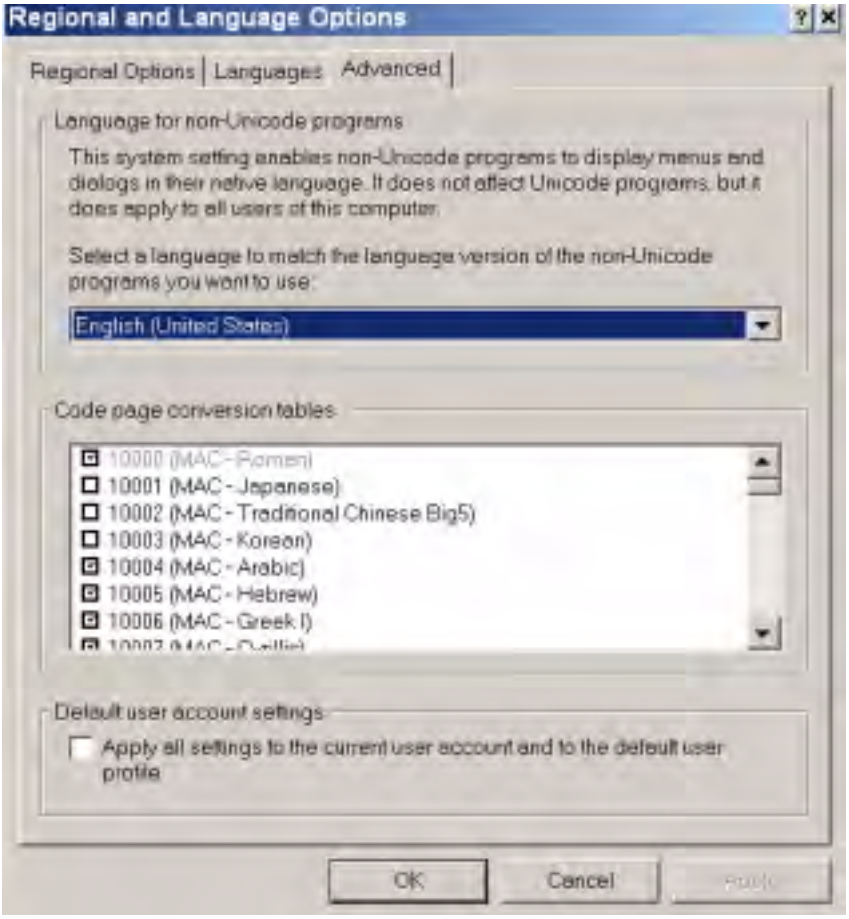

Regional and Language Options
Regional Options
Languages
Advanced
Language for non-Unicode programs
This system setting enables non-Unicode programs to display menus and dialogs in their native language. It does not affect Unicode programs, but it does apply to all users of this computer.
Select a language to match the language version of the non-Unicode programs you want to use:
English (United States)
Code page conversion tables
10001 (MAC - Japanese)
10002 (MAC - Traditional Chinese Big5)
10003 (MAC - Korean)
10004 (MAC - Arabic)
10005 (MAC - Hebrew)
10006 (MAC - Greek I)
Default user account settings
Apply all settings to the current user account and to the default user profile
OK
Cancel

Figure 3-61 Advanced

3-7-3-6 Add Printer

NOTE: This option should not be used by un-authorized personnel. This option will prompt you to the Windows Installation Wizard. Normally, all software drivers are pre-installed and there is no need to use this functionality. In special cases where there is a need, follow the instructions provided by GE Medical Systems or the instructions in the respective printer installation manual.

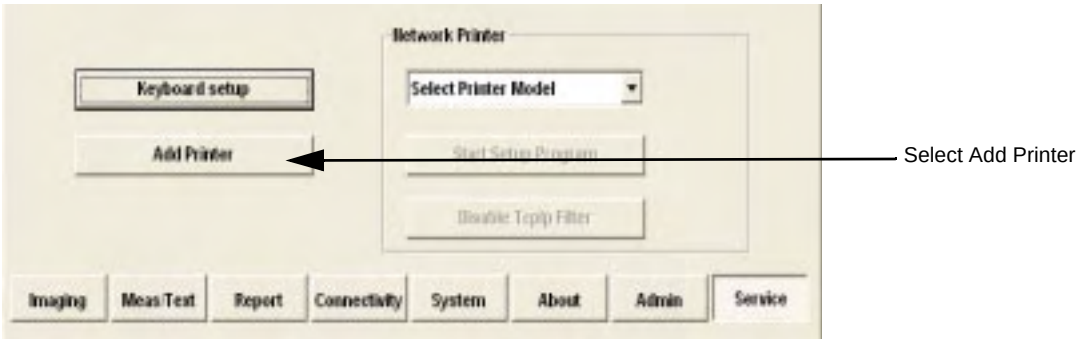


Figure 3-62 Select Add Printer

1.) Select ADD PRINTER to start the Add Printer (Installation) Wizard.

Add Printer Wizard
Welcome to the Add Printer Wizard
This wizard helps you install a printer or make printer connections.
If you have a Plug and Play printer that connects through a USB port (or any other hot pluggable port, such as IEEE 1394, infrared, and so on), you do not need to use this wizard. Click Cancel to close the wizard, and then plug the printer's cable into your computer or point the printer toward your computer's infrared port, and turn the printer on. Windows will automatically install the printer for you.
To continue, click Next.
< Back
Next >
Cancel

Figure 3-63 Add Printer Wizard

2.) Follow the instructions in the Wizard to install a new printer.

3-7-4 Configuring Peripherals

3-7-4-1 Approved Peripherals

The following lists the internal peripherals available for use with the Vivid-i™ portable ultrasound scanner and details their method of connection:

- Printer - Black & White, digital, Sony (via USB).
- Printer - Color, digital, Sony (via USB).
- VCR - Mitsubishi, both PAL and NTSC versions are available (via VGA to S-Video converter).
- MO Drive (via USB).
- DVD\CD-R Drive (via USB).
- Printer - Deskjet, HP-450 (via USB or Bluetooth optional).
- Virtual printer (any of the DeskJet printers can be used as virtual printers when the user is in a remote location).

NOTICE Vivid-i™ supports reading of DVD media, but not writing data to DVD.

3-7-4-2 Network Peripherals (Optional)

The printers detailed below are connected via Ethernet (TCP/IP Network).

- **Lexmark Color LaserWriter Network Printer.**
  The printer is available in the following versions:
  - 100 V AC
    Lexmark C762 Color Printer
  - 110 V AC
    Lexmark C762 Color Printer
  - 220 V AC
    Lexmark C762 Color Printer

  Installation of the Lexmark C762 Color Printer is described in the *Lexmark C752N/C762N Color Printer Installation Manual*, Direction Number FC194475.

3-7-4-3 Virtual Printing (Optional)

Virtual printing is not configurable. The functionality of virtual printing provides the ability to print to a specific printer, even though it is not physically connected.

Once the printer has been re-connected again, all the spooled print jobs will be printed out automatically.

Sometimes this feature is device dependent. Therefore, in order to initiate the manual "print of all spooled jobs" process, proceed as described below.

1.) Press <**ALT**> + **P**.

The Printers and Faxes window is displayed.

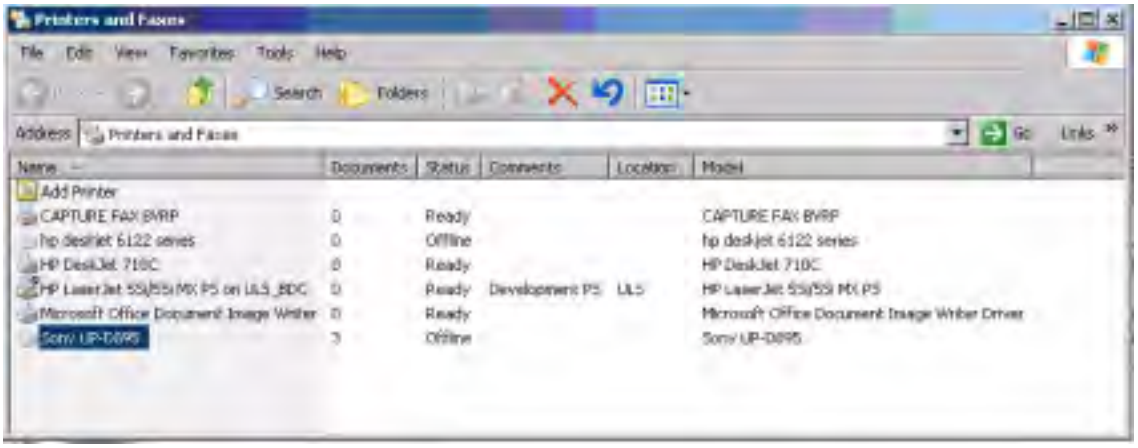

Printers and Faxes
File Edit View Favorites Tools Help
Search Folders
Address Printers and Faxes
Go Links
Name Documents Status Comments Location Model
Add Printer
CAPTURE FAX BVRP 0 Ready CAPTURE FAX BVRP
hp deskjet 6122 series 0 Offline hp deskjet 6122 series
HP DeskJet 710C 0 Ready HP DeskJet 710C
HP LaserJet 5Si/5Si MX PS on ULS_BDC 0 Ready Development PS ULS HP LaserJet 5Si/5Si MX PS
Microsoft Office Document Image Writer 0 Ready Microsoft Office Document Image Writer Driver
Sony UP-D895 3 Offline Sony UP-D895

Figure 3-64 Printers and Faxes Window

2) Right-click on the destination virtual printer (see Figure 3-64) and select **Open**.

The Virtual Printer Job Queue window is displayed.

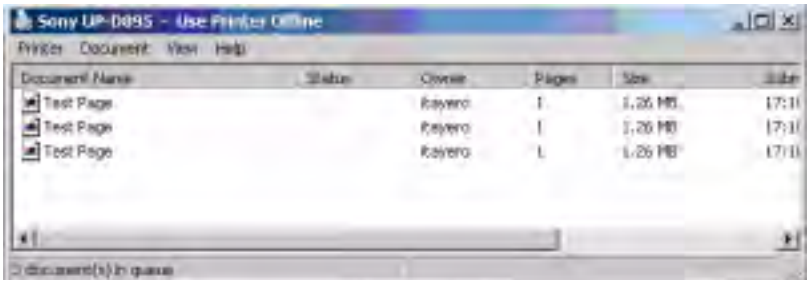

Sony UP-D895 - Use Printer Offline
Printer Document View Help
Document Name Status Owner Pages Size Time
Test Page Rayero 1 1.26 MB 17:11
Test Page Rayero 1 1.26 MB 17:11
Test Page Rayero 1 1.26 MB 17:11
document(s) in queue

Figure 3-65 Virtual Printer Job Queue Window

3.) From the queued Print Jobs, right-click and select **Cancel** to clear any spooled jobs not required.

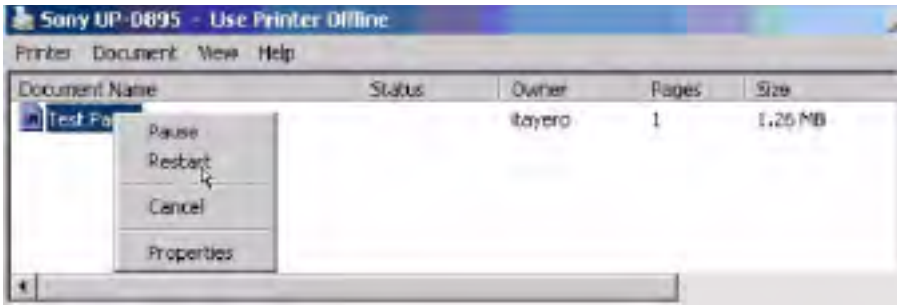


Figure 3-66 Resuming Spooled Print Job

4.) Right-click and select **Restart** to resume print job/s for printing, as required

3-7-5 Software Options Configuration

3-7-5-1 Software Option Installation

A Password (Software Option String) enables a software option or a combination of software options. This password is specific for each Vivid-i™.

3-7-5-2 On-site Configuration

1.) Press **CONFIG** (**F2**) and log on as *Adm* - see *Log On to the System as ADM* on page 4 - 11.

2.) Select ADMIN (lower part of window),

3.) Select the SYSTEM ADMIN tab.

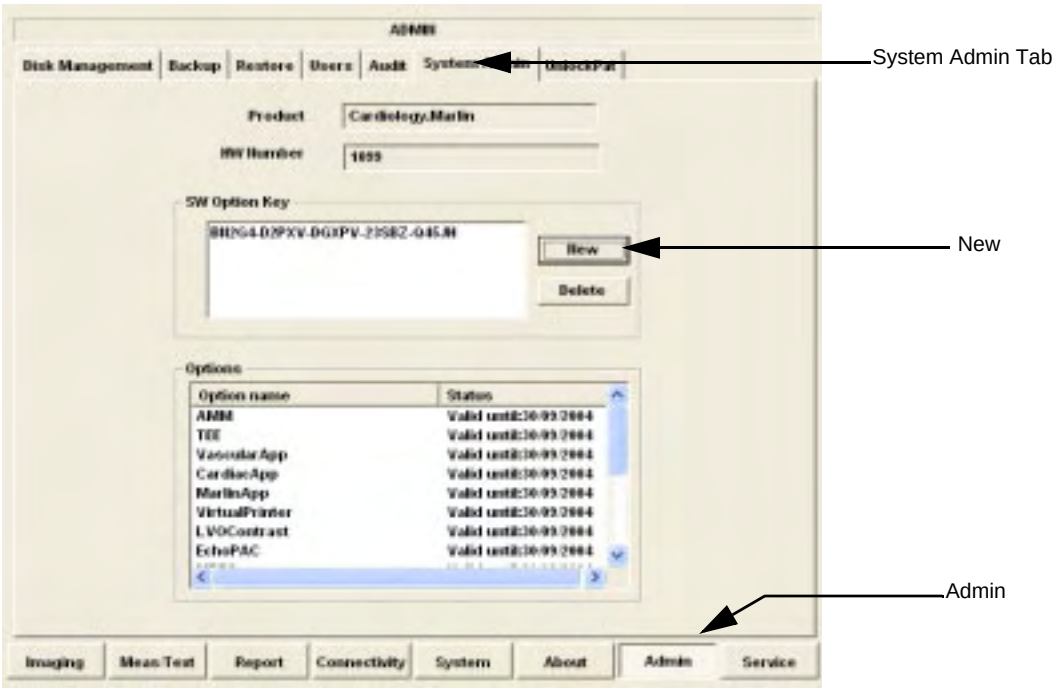


Figure 3-67 System Admin screen

4.) Select NEW to open the New Key dialog where you type the Software Option Key (Serial String).

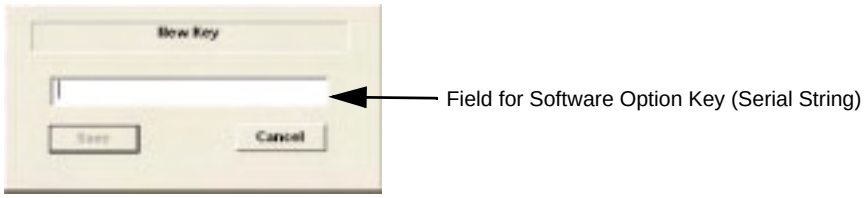


Figure 3-68 Type Software Option Key

CAUTION **Incorrect password entry will result in loss of system options.**
If password is incorrect, please contact your local GE Service representative.

5.) Type the Password (Software Option Key).

6.) Press OK to save the new setting.

7.) Close the Config window.

3-7-5-3 Remote Check and Configuration

Contact the OnLine Center for InSite Checkout.

Section 3-8
Connectivity Setup

3-8-1 Connectivity Introduction

The Vivid-i™ ultrasound unit can be connected to various connectivity devices, such as DICOM devices and EchoPac servers. The following sections describe how to connect the system to a remote archive/work station or a DICOM service, using a TCP/IP connection.

This section describes communication and connection options between the Vivid-i™ ultrasound unit and other devices in the hospital information system.

The following scenarios are covered:

- A stand-alone Vivid-i™ scanner.
- A Vivid-i™ and one or several EchoPAC PC workstations in a “Sneaker Net” environment. (“Sneaker Net” means that you use an MO Disk to move data because no network is available).
- A Vivid-i™ and an EchoPAC PC workstation in a direct connect environment.
- A Vivid-i™ and a DICOM server in a network.
- A Vivid-i™ scanner configured for MPEGVue export to removable media: CD, DVD, or USB Memory stick. (Data can later be viewed on any remote PC).
- A Vivid-i™ workstation connected to the Hospital Information System (HIS), via the Vivid HL7 Gateway.
- A Vivid-i™ scanner configured for eVue.
  Images or loops may be transmitted to a designated PC (“e-Vue PC”) on the network (in compact MPEG format), and will appear at the review PC in almost real time.

3-8-1-1 The Dataflow Concept

Communication between the Vivid-i™ ultrasound unit and other information providers on the network takes the form of dataflows. Each dataflow defines the transfer of patient information from either an input source to the unit, or from the unit to an output source (see examples in Figure 3-69 on page 3-75).

Patient information can include demographic data and images, as well as reports and Measurement and Analysis (M&A) data.

A dataflow is a set of pre-configured services. Selecting a dataflow will automatically customize the ultrasound unit to work according to the services associated with this dataflow.

By utilizing dataflows, the user can configure the Vivid-i™ ultrasound unit to optimally meet the needs of the facility, while keeping the user interface unchanged. Once the dataflow is selected, the actual location of the database is entirely transparent.

3-8-1-2 Dataflow Naming Convention

The predefined dataflows have descriptive names.

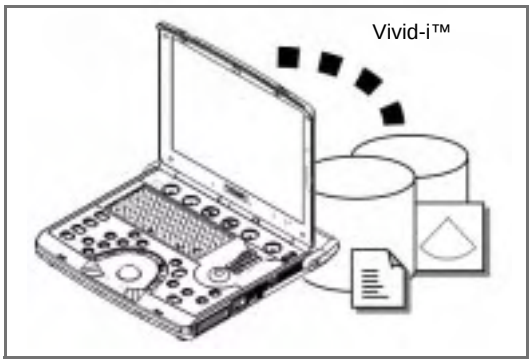
Example: *LocalArchive-MOD dataflow*

The name indicates that patient data is archived locally in the archive on the internal hard disk and images are stored to an MO disk.

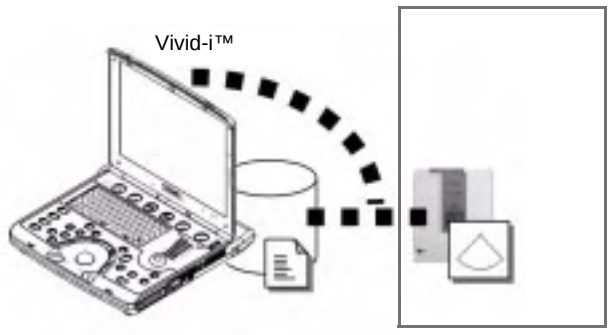
A list of all the predefined dataflows is included in the Vivid-i™ User’s Manual.

3-8-1-3 Dataflow Examples

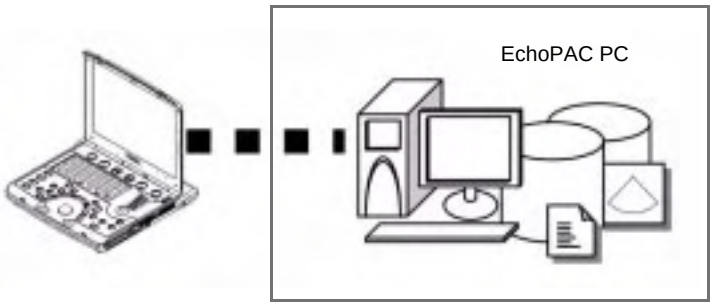
LocalArchive-Int.HD dataflow:
The local database is used for patient archiving.
Images are stored to internal hard drive.



LocalArchive-MOD dataflow:
The local database is used for patient archiving.
Images are stored to a MOD



RemoteArch-RemoteHD dataflow:
A remote database is used for patient archiving.
Images are also stored to a remote archive.



Worklist/Local Archive-DICOMServer/Int.HD dataflow:
Search in the DICOM Modality Worklist, the patient found is copied into local database.

The patient information and the examination results are stored to the local database.

Images are stored to a DICOM server and to an image network volume on the local hard drive.

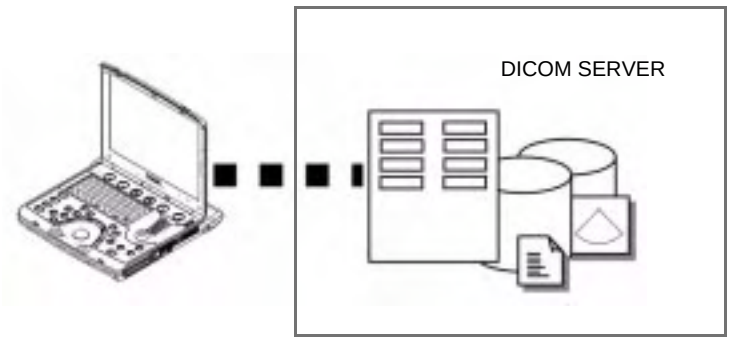


Figure 3-69 Examples of Dataflows

3-8-1-4 Stand-alone Vivid-i™

In this scenario, images will most likely be reviewed from a VCR tape. If digital images are stored, they should be saved directly on a MOD.

3-8-1-5 "Sneaker Net" Environment

In this scenario, the EchoPAC PC (one or several) is used for review of studies acquired on one or more Vivid-i™ scanners without being connected in a network. Images can be stored on the scanner's internal hard drive (recommended) or on a dedicated MOD.

- **Images Stored on Internal Hard Drive**

  In this configuration, images are first stored on the Vivid-i™ scanner's hard drive and then exported from the scanner's hard drive to a sneaker MOD, and finally imported from the sneaker MOD to the EchoPAC PC's internal hard drive.

- **Images Stored on Dedicated MO Disk**

  In this configuration, the images are stored directly on a dedicated MOD and imported to the EchoPAC PC's internal hard drive.

3-8-1-6 Direct Connection from Vivid-i™ to an EchoPAC PC Workstation

In this configuration, the data is transferred from the Vivid-i™ to a dedicated EchoPAC PC Workstation over an Ethernet connection.

The connection may be done in one of three ways:

- with a crossover cable as a Peer-to-Peer Network
- connection via a Local Area Network (LAN) - set up for this special use only.
- connection via the hospital network (Local Area Network - LAN or Wide Area Network - WAN)

The database from the EchoPAC PC is used as the master and images are stored directly to the EchoPAC PC internal hard drive.

In this configuration, the scanner is just an intermediate acquisition unit which, after completion of a study, will not contain any patient information, measurements, or images. The acquisition can be done online or offline.

3-8-1-7 Vivid-i™ and a DICOM Server in a Network

In this configuration, the Vivid-i™ is configured to work with a DICOM server in a network environment. Usually, this will be the hospital network. Images are first saved on the local image buffer on the scanner. At the end of the examination, the images are sent to the DICOM server via a DICOM spooler. This scenario requires that the scanner is configured to be connected to the DICOM server.

3-8-2 Physical Connection

3-8-2-1 Ethernet Switch Connections

An Ethernet Switch (P/N: 066E0741), is used to connect the Vivid-i™ system to an EchoPAC PC and a network printer.

Informative LEDS
FS705
Ethernet Cable connectors
MDI Button Controls the fifth connector, making it crossed or non-crossed.

Figure 3-1

Figure 3-70 Ethernet Switch Identifications

Position	Label	Function
	X To PC	To connect an end station or a Server to the Port
	= To HUB	To connect a HUB or another Switch to the Port

Table 3-26 MDI Button Position Descriptions

3-8-2-2 Local Network Connection to EchoPAC PC Workstation

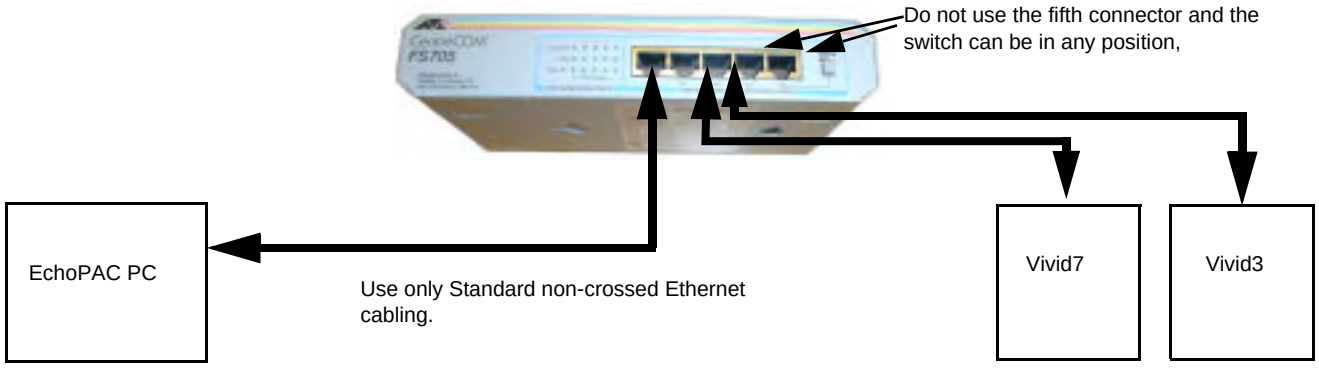

Do not use the fifth connector and the switch can be in any position,
EchoPAC PC
Use only Standard non-crossed Ethernet cabling.
Vivid7
Vivid3

Figure 3-71 Local Network Connection

3-8-2-3 Hospital Network Connection to EchoPAC PC Workstation

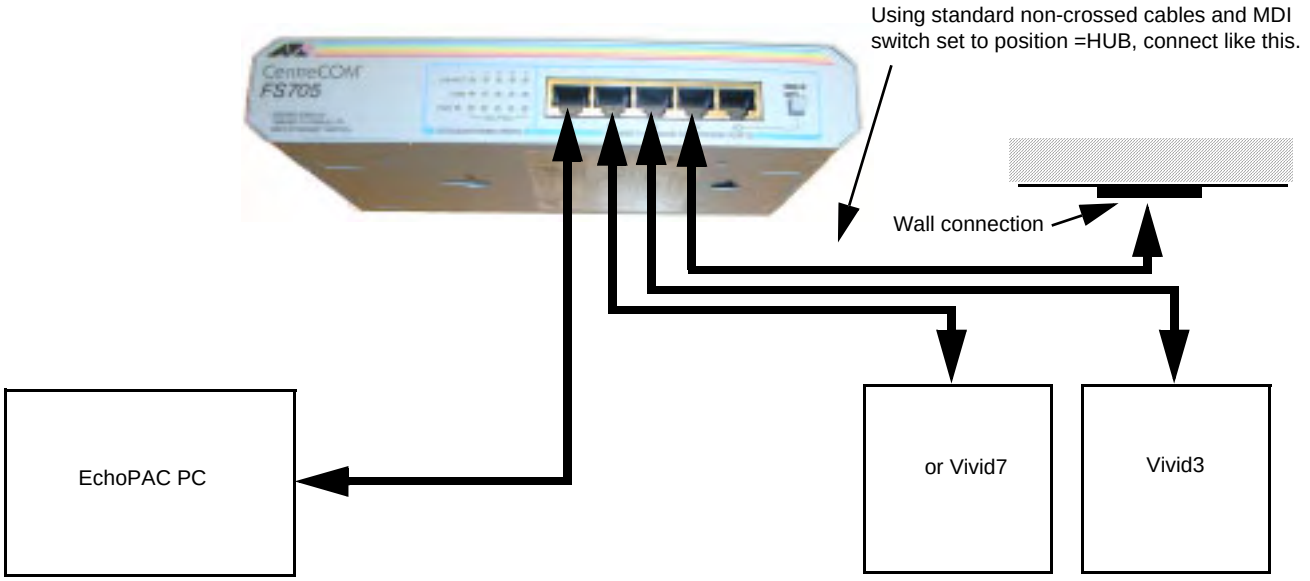

Using standard non-crossed cables and MDI switch set to position =HUB, connect like this.
Wall connection
EchoPAC PC
or Vivid7
Vivid3

Figure 3-72 Hospital Network Connections

See the EchoPAC PC Service Manual (Part Number EP091298) for details about the EchoPAC PC, and the required set-up procedures.

3-8-2-4 Wireless Network Configuration

The following procedure is used to configure the Vivid-i™ system for a wireless network environment.

NOTE: Do not use any other type of wireless adaptor other than the Cisco 350 Series WLAN card.

1.) Press **CONFIG** (**F2**) and log on as *Adm*, as described in Log On to the System as ADM on page 4 - 11.

2.) Select CONNECTIVITY (lower part of window).

3.) Select the TCP/IP tab.

4.) Click the **Advanced Settings** button.

The “Network and Dial-up Connections” dialog box is displayed:

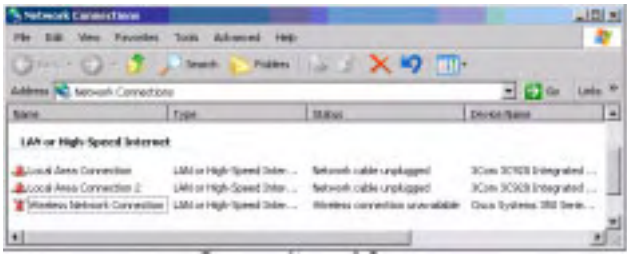
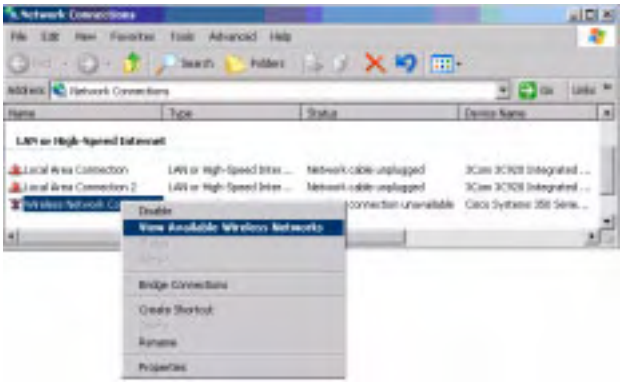


Figure 3-73 Network and Dial-up Connections

5.) Select **Wireless Network Connection**, right-click and choose **View Available Wireless Networks** as shown below:



The Wireless Network Connection dialog box is displayed, as shown in Figure 3-74 on page 3-80.

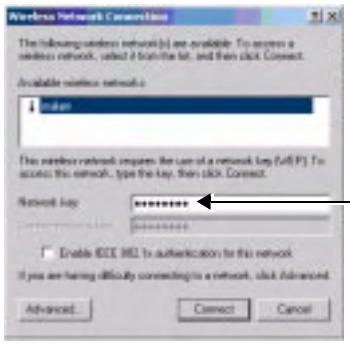


Figure 3-74 Wireless Network Connection Dialog Box

6.) Type the Network key (supplied by the Local IT group) in the *Network Key* field and press **Connect**.

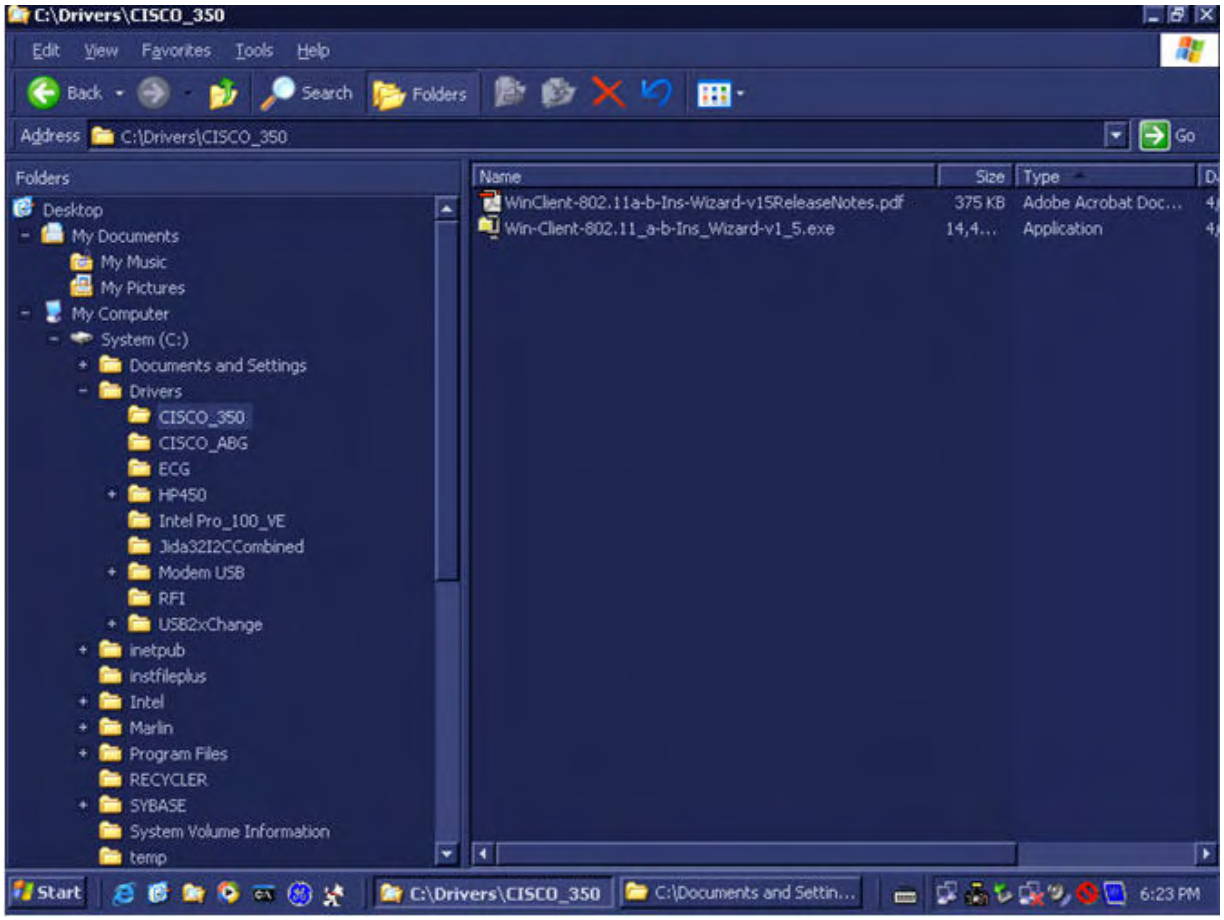


Figure 3-75 CISCO_350 Sub-directory

7) .

3-8-2-5 Stand-alone Vivid-i™

No network connection needed.

3-8-2-6 "Sneaker Net" Environment

No network connection needed.

3-8-2-7 Connection from Vivid-i™ to an EchoPAC PC Workstation

Direct Cable Connection from Vivid-i™ to an EchoPAC PC Workstation via a Crossover Cable

You will only need a Crossover Cable for network use to connect the two units this way.

1.) Connect one end of the Crossover Cable to the network connector on the Vivid-i™.
2.) Connect the other end to the network connector to the EchoPAC PC Workstation, see Chapter 3 in the EchoPAC PC Workstation Service Manual.

Connection via a Peer-to-Peer Network

You will need a network hub and one network cable for each unit connected to the hub.

See Ethernet Switch Connections on page 3 - 77.

Connection via Hospital Network

You will need one network cable to connect the Vivid-i™ to a wall outlet on the hospital's network.

3-8-2-8 Connection between a Vivid-i™ and a DICOM Server on a Network

You will need one network cable.

1.) Connect one end of the cable to the Ethernet connector on the Vivid-i™.
2.) Connect the other end of the cable to the wall outlet.

If a Peer-to-Peer Network is connected to the hospital's network, you may connect the Vivid-i™ to the Peer-to-Peer Network.

3-8-3 Connectivity Configuration

NOTE: If connected to a stand-alone network (Peer-to-Peer network with a Vivid-i™ scanner, an EchoPAC PC work station and eventually a network printer), you should use default delivery settings.

3-8-3-1 Introduction

To be able to use the network functions when connected to a hospital network, the scanner must have a proper network address.

- Before you can set up the scanner, you need to collect some information. Refer to the "Worksheet for DICOM Network Information in Figure 2-3 on page 2-12. Typically, the source for this information is the network administrator.
- Follow the steps below to prepare the scanner for use on the network.

3-8-3-2 Select TCP/IP Set-up Screen

1.) Press **CONFIG** (**F2**) and log on as *Adm*, as described in Log On to the System as ADM on page 4 - 11

2.) If not already selected, select CONNECTIVITY from the bottom of the screen.

3.) Select the TCP/IP TAB (it is named Tcpip).

.

Computer Name:
For Vivid-i™, this name is on the form: *Vivid_I-00nnnn*, where “00nnnn” is a number (nnnn is the scanner’s serial number).

IP Settings:
IP Settings area for the Vivid-i™ scanner.

Remote Archive Setup area:
IP settings area for a Remote Archive. Example: EchoServer.
Default Setup:
Remote Archive IP-Addr: 10.0.0.4
Remote Archive Name: EchoPAC7-000001

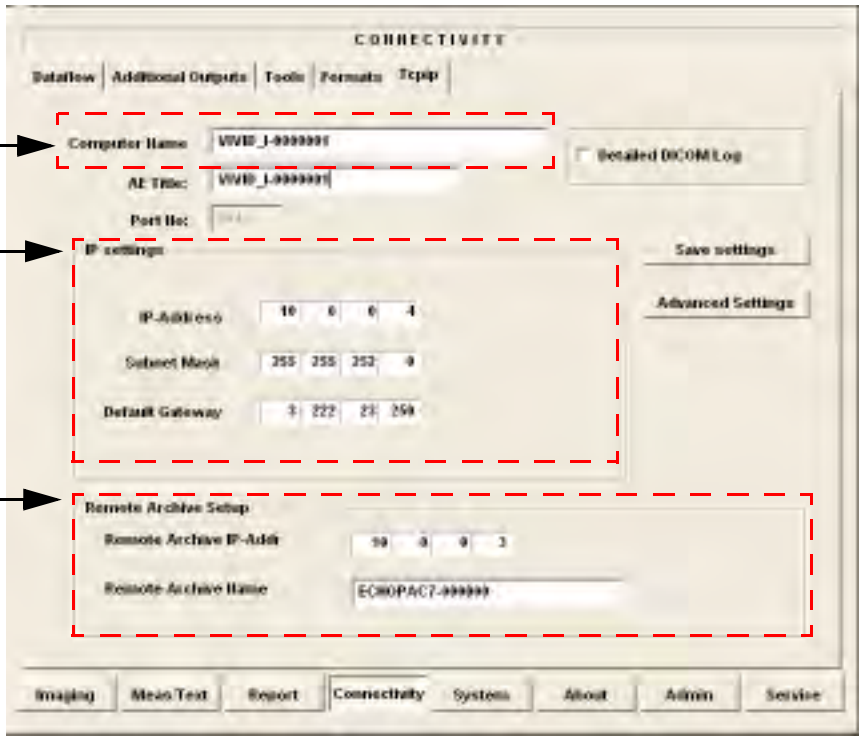


Figure 3-76 TCP/IP Set-up Screen for Vivid-i™, Overview (Example)

3-8-3-3 Set the Scanner's Network Information

In the IP settings area of the screen, enter the following:

1.) IP Address for scanner. (Default IP Address from factory: 10.0.0.3).
2.) Subnet Mask for scanner. (Default Subnet Masks from factory: 255.255.255).
3.) IP address for Default Gateway. (Default Gateways from factory IP address: 0.0.0.0).
4.) In addition, the scanner's AE Title must be entered in the DICOM server's setup.

.

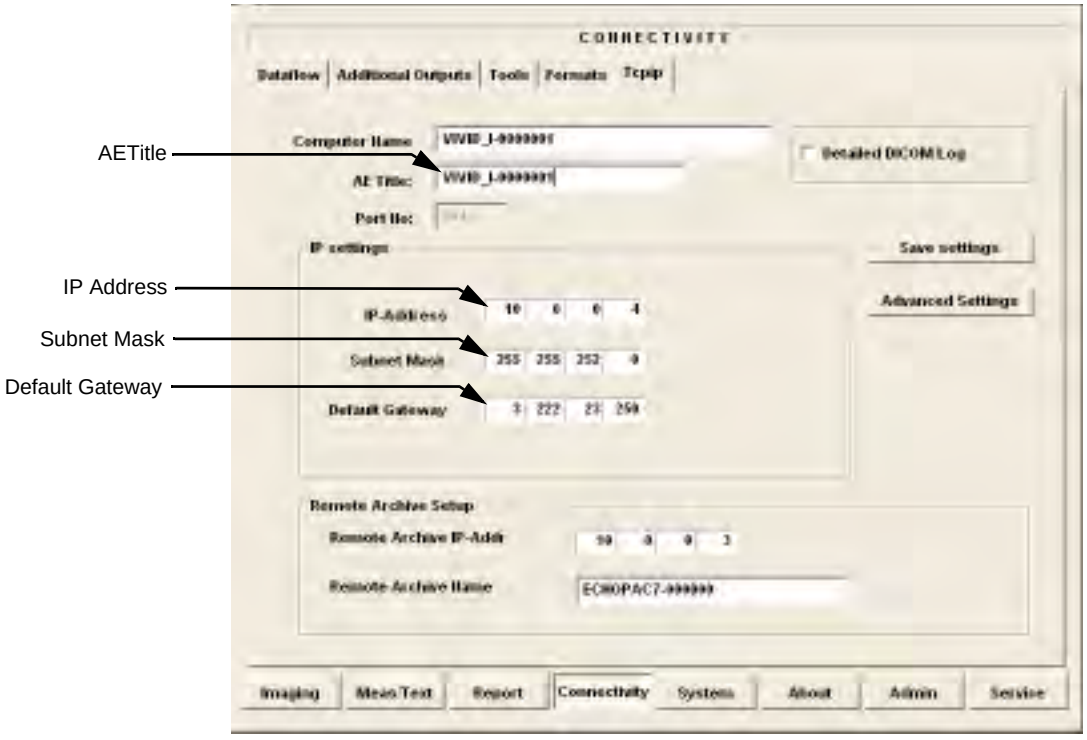


Figure 3-77 TCP/IP Set-up for Vivid-i™

3-8-3-4 Set the Remote Archive's Network Information

In the Remote Archive Setup area of the screen (see example in Figure 3-78), enter the following:

1.) Remote Archive IP address. (Default IP Address from factory: 10.0.0.4).
2.) Remote Archive Name. (Default Remote Archive Name from factory: ECHOPAC7-000001).

.

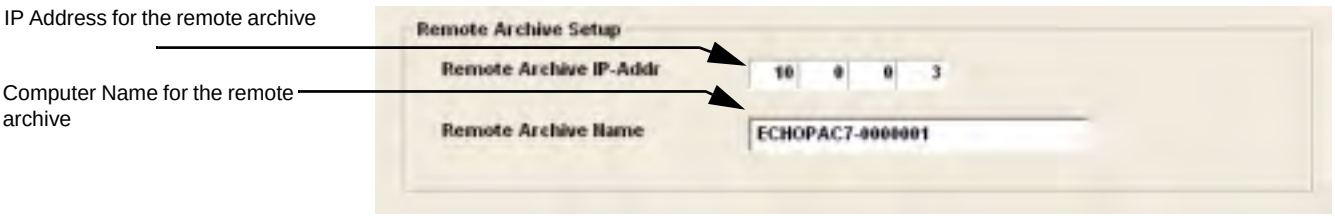


Figure 3-78 TCP/IP Set-up for Vivid-i™

3-8-3-5 Save the New Settings

1.) Press SAVE SETTINGS to save the new settings.

.

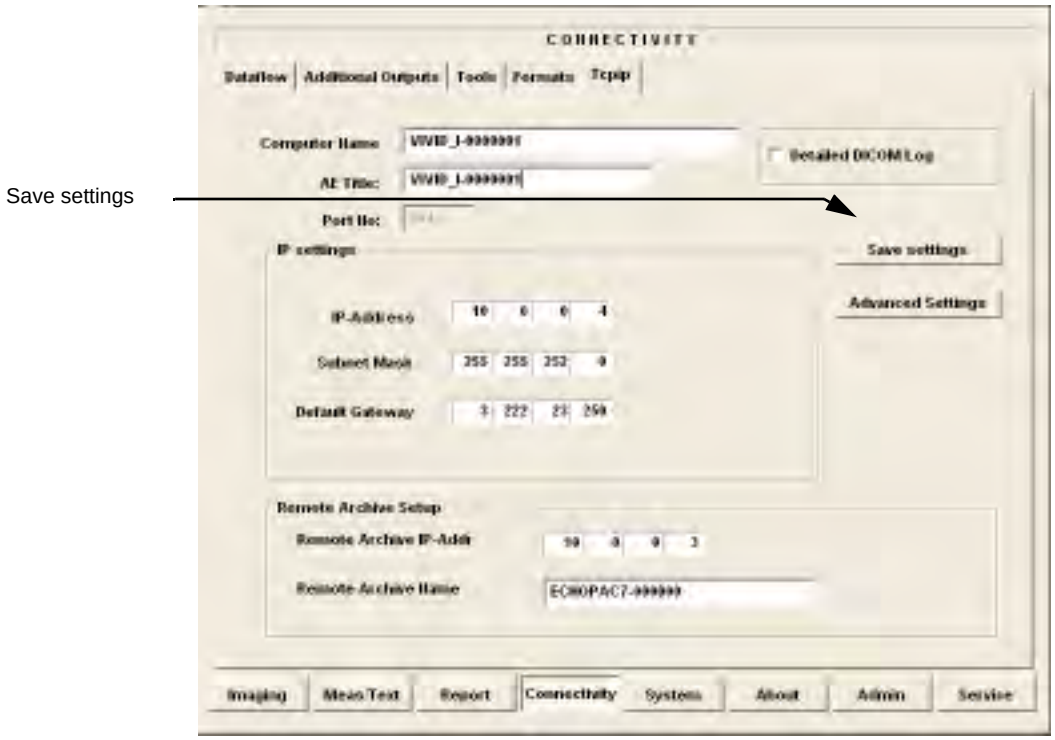


Figure 3-79 Save New TCP/IP settings

The new settings are saved to a common settings file. After a restart, the settings are also included in other screens.

2.) Restart the Vivid-i™ system to activate the changes.

3-8-3-6 Configuring the Vivid-i™ and Network PC for a Peer-to-Peer Connection

NOTE: The following steps are performed on the Vivid-i™ scanner.
The instruction Select = trackball to the specific item and press the Set button on the control panel.

1.) On the Vivid-i™ control panel, press the **Config** button.

2.) From the System Configuration window, click the **Connectivity** tab at the bottom of the window.

The Connectivity dialog box opens.

3.) Select the **TCPIP Tab.**

4.) Trackball to the **Advanced** tab and press the **Set** button on the control panel.

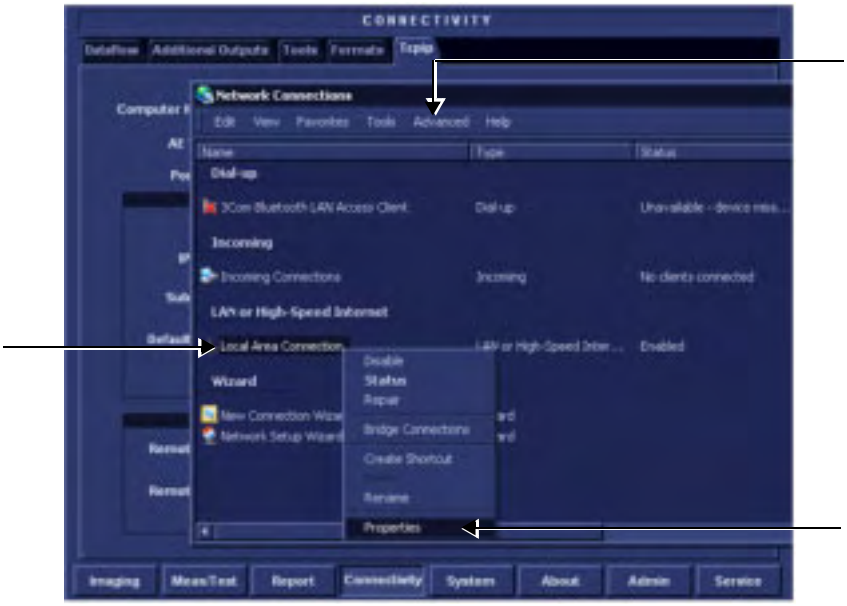


Figure 3-80 Connectivity Dialog Box - TCPIP Advanced Tab

5.) Select the **Local Area Connection**, as shown in Figure 3-80.

6.) Press the **Menu** button on the control panel.

7.) From the drop-down menu, select **Properties**.

The Local Area Connection Properties dialog box opens.

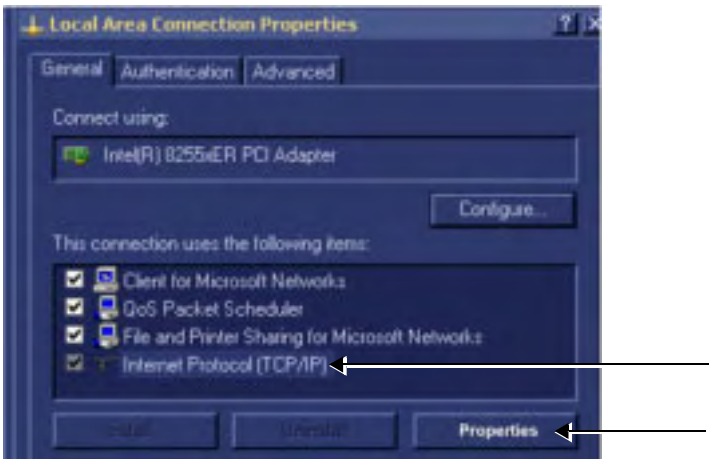


Figure 3-81 Local Area Connection Properties

8.) Select **Internet Protocol (TCP/IP)**.

9.) Click the **Properties** button.

The Internet Protocol (TCP/IP) Properties dialog box opens.

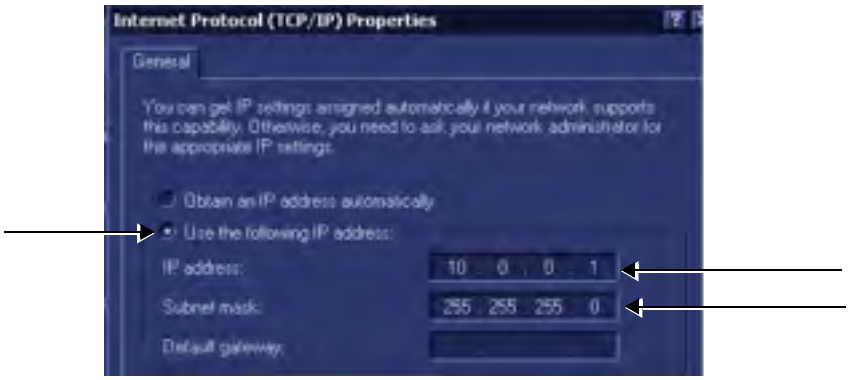

Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
10 . 0 . 0 . 1
Subnet mask:
255 . 255 . 255 . 0
Default gateway:

Figure 3-82 Internet Protocol (TCP/IP) Properties

10.) Activate the **Use the following IP address** check box.

11.) Type in the Vivid-i™ **IP address 10.0.0.1**.

Note: The IP must be *different* from the IP address used for network computer.

12.) Type in the **Subnet mask 255.255.255.0.**

Note: The Subnet mask should be the *same* for both the network computer and the Vivid-i™.

13.) Click **OK**

14.) Press the **Config** button on the control panel to close all windows and return to the regular scanning mode.

NOTE: The following steps are performed on the Network Computer.

1) On the network computer, access the Control Panel, as follows:

a.) Double-click on **My Computer** icon on desktop.

b.) Double-click on **Control Panel** icon.

2) Double-click on **Network Connections** icon.

3) Double-click on **Local Area Connection** icon.

The Local Area Connection Properties dialog box opens.

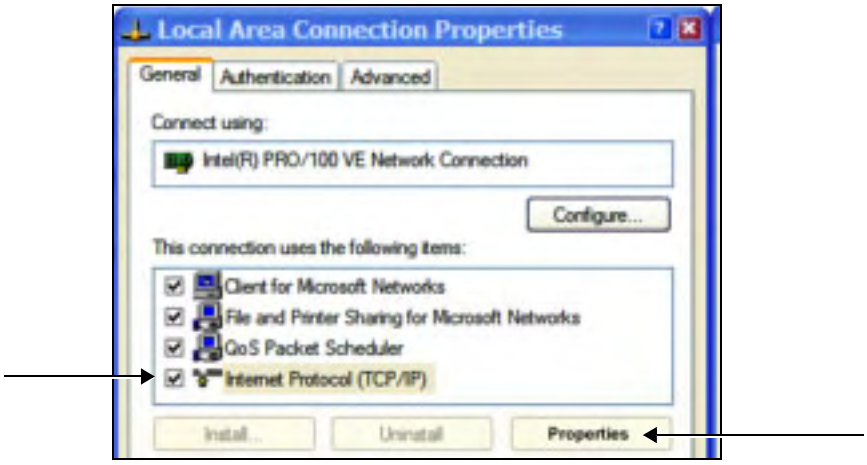


Figure 3-83 Local Area Connection Properties

4) Select **Internet Protocol (TCP/IP)**.

5) Click the **Properties** button.

The Internet Protocol (TCP/IP) Properties dialog box opens.

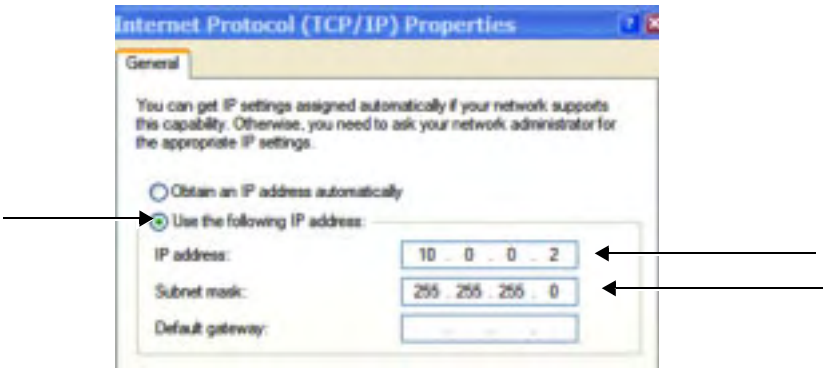

Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
10 . 0 . 0 . 2
Subnet mask:
255 . 255 . 255 . 0
Default gateway:

Figure 3-84 Internet Protocol (TCP/IP) Properties

6.) Activate the **Use the following IP address** check box.

7) Type in the network computer's **IP address 10.0.0.2**.

Note: The IP address must be *different* from the one used for the Vivid-i™ system.

8) Type in the **Subnet mask 255.255.255.0**.

Note: The Subnet mask should be the *same* for both the network computer and the Vivid-i™.

9) Click **OK**, close all windows and approve all changes. Return to regular mode.

10) Connect the Vivid-i™ and network computer LAN connection using a cross over Network cable. (Normally with RED connector covers on both sides, cable not longer than 100 meters).

The Vivid-i™ and the network computer are now ready for export, import of files.

Note: One can check the connection by pinging to theVivid-i™ IP, as follows:

a.) Select <**Start**>, <**Run**>

b.) Type **CMD**, then press <**Enter**>

c.) Type **Ping** and **IP 10.0.0.1** for Vivid-i™ then press <**Enter**>.

If return timing is OK, you have an operating network connection.

3-8-3-7 Configuring the Vivid-i™ and Network PC for a LAN Connection

NOTE: The following steps are performed on the Vivid-i™ scanner.
The instruction Select = trackball to the specific item and press the Set button on the control panel.

1.) On the Vivid-i™ control panel, press the **Config** button.

2.) From the System Configuration window, click the **Connectivity** tab at the bottom of the window.

The Connectivity dialog box opens.

3.) Select the **TCPIP Tab.**

4.) Trackball to the **Advanced** tab and press the **Set** button on the control panel.

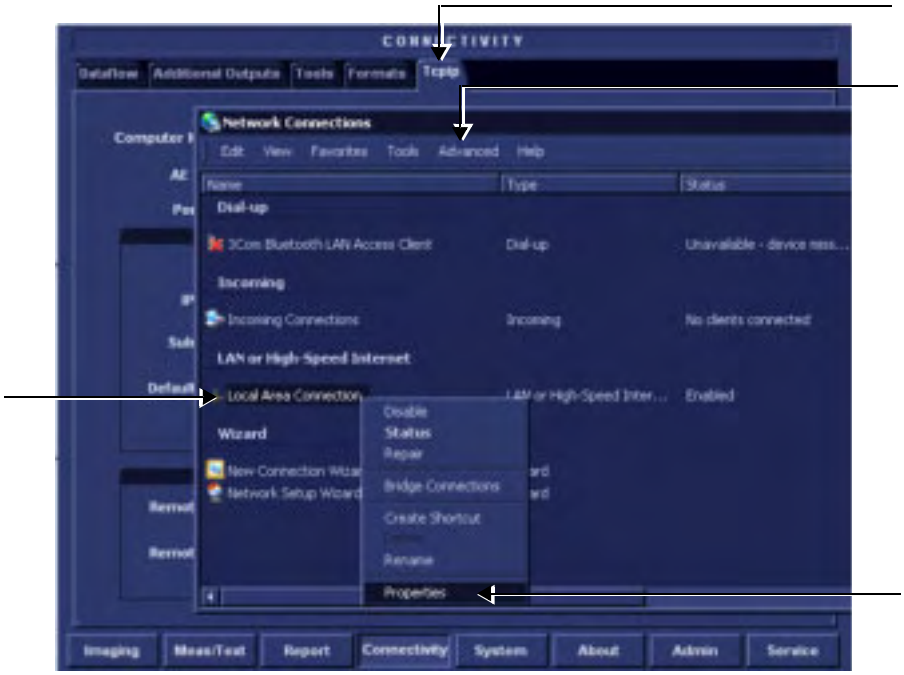


Figure 3-85 Connectivity Dialog Box - TCPIP Advanced Tab

5.) Select the **Local Area Connection**, as shown in Figure 3-80.

6.) Press the **Menu** button on the control panel.

7.) From the drop-down menu, select **Properties**.

The Local Area Connection Properties dialog box opens.

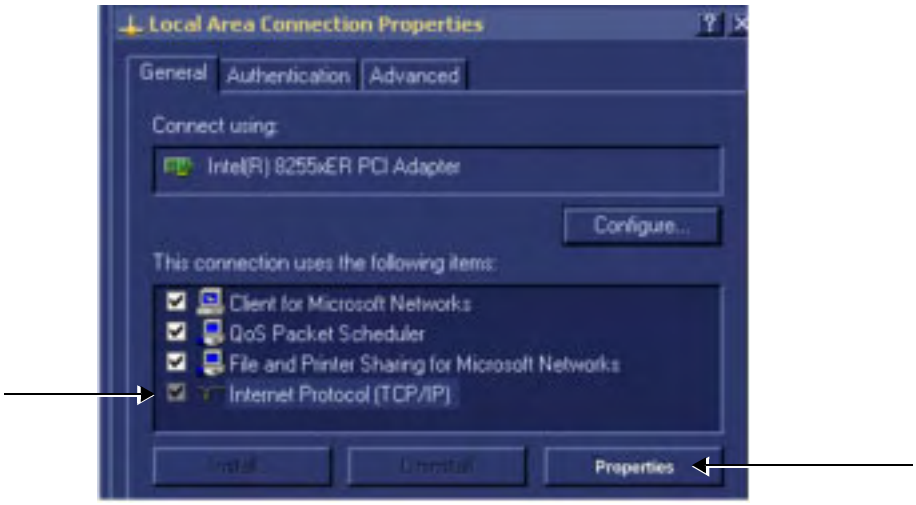


Figure 3-86 Local Area Connection Properties

8) Select **Internet Protocol (TCP/IP)**.

9) Click the **Properties** button.

The Internet Protocol (TCP/IP) Properties dialog box opens.

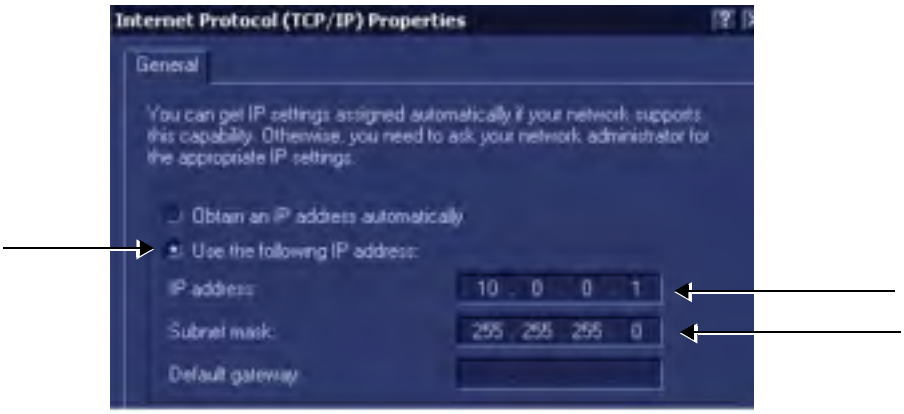

Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
10 . 0 . 0 . 1
Subnet mask:
255 . 255 . 255 . 0
Default gateway:

Figure 3-87 Internet Protocol (TCP/IP) Properties

10.) Activate the **Use the following IP address** check box.

11.) Type in the Vivid-i™ **IP address 10.0.0.1** or the one provided by the local network administrator.

Note: The IP must be *different* from the IP address used for network computer.

12.) Type in the **Subnet mask 255.255.255.0** or the one provided by the local network administrator.

Note: The Subnet mask should be the *same* for both the network computer and the Vivid-i™.

13.) Click **OK**

14.) Press the **Config** button on the control panel to close all windows and return to the regular scanning mode.

NOTE: The following steps are performed on the Network Computer.

1) On the network computer, access the Control Panel, as follows:

   a.) Double-click on **My Computer** icon on desktop.

   b.) Double-click on **Control Panel** icon.

2) Double-click on **Network Connections** icon.

3) Double-click on **Local Area Connection** icon.

   The Local Area Connection Properties dialog box opens.

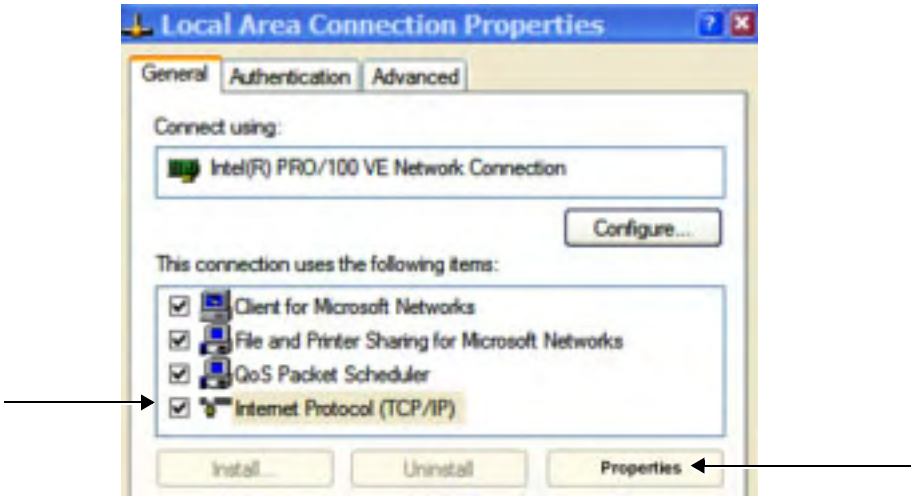


Figure 3-88 Local Area Connection Properties

4) Select **Internet Protocol (TCP/IP)**.

5) Click the **Properties** button.

The Internet Protocol (TCP/IP) Properties dialog box opens.

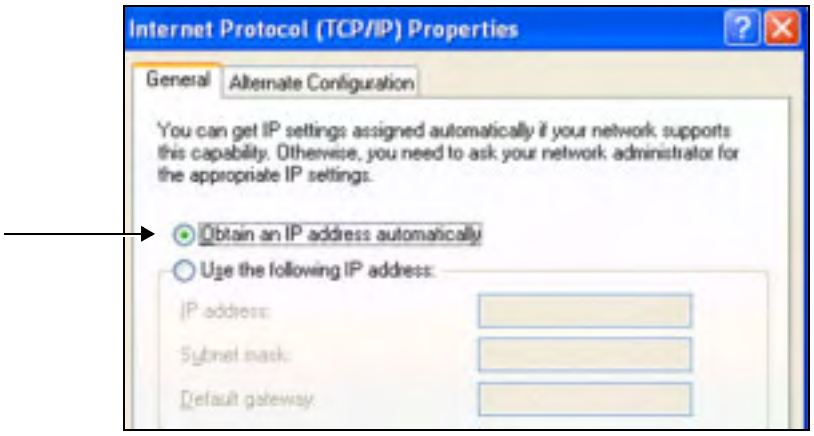

Internet Protocol (TCP/IP) Properties
General
Alternate Configuration
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
Subnet mask:
Default gateway:

Figure 3-89 Internet Protocol (TCP/IP) Properties

6.) Activate the **Obtain an IP address automatically** check box.

7) Click **OK**, close all windows and approve all changes. Return to regular mode.

8) Connect the Vivid-i™ and network computer LAN connection using a regular Network cable.

The Vivid-i™ and the network computer are now ready for export, import of files.

Note: One can check the connection by pinging to theVivid-i™ IP, as follows:

a.) Select <**Start**>, <**Run**>

b.) Type **CMD**, then press <**Enter**>

c.) Type **Ping** and **IP 10.0.0.1** for Vivid-i™ then press <**Enter**>.

If return timing is OK, you have an operating network connection.

3-8-4 Set Up Connection to a DICOM Server in a Network

In this case, the Vivid-i™ is configured to work with a DICOM server in a network environment. Images are first saved on the local image buffer on the scanner. At the end of the examination, the images are sent to the DICOM server via a DICOM spooler.

This scenario requires that the scanner is configured to be connected to the DICOM server as described below.

3-8-4-1 Overview

To work against the DICOM server, the following information has to be entered in the scanner:

- DICOM server IP address, subnet mask and eventually the gateway.
- DICOM server port number.
- DICOM server AE title (the server application's name).
- Name of Device.

3-8-4-2 DICOM Server IP Address Setting on the Scanner

1.) Press **CONFIG** (**F2**) and log on as *Adm*, as described in Log On to the System as ADM on page 4 - 11.

2.) Select CONNECTIVITY (in the lower part of the window).

3.) Select the DATAFLOW tab.

4.) Select the arrow to the right of the Name field to list all dataflows in a pull-down menu, see Figure 3-90.

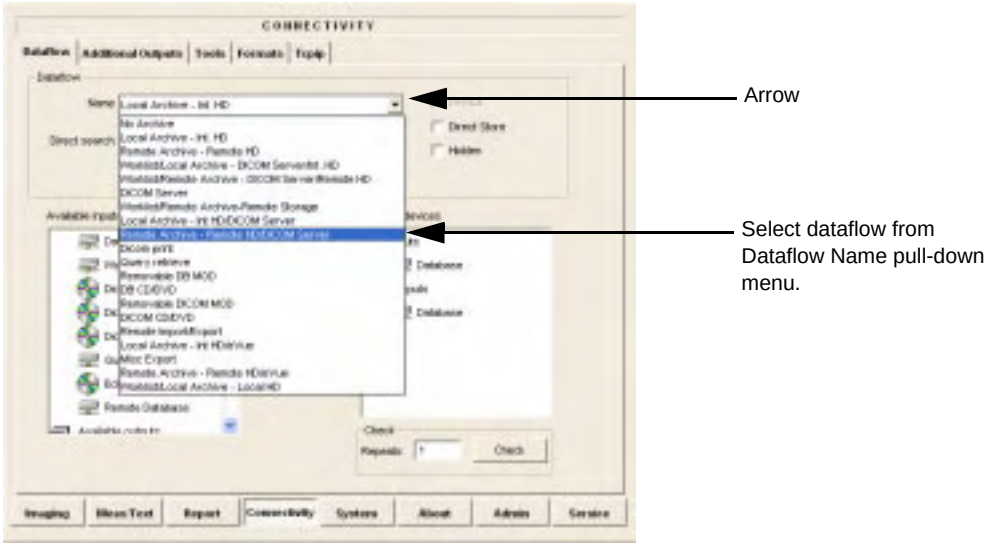


Figure 3-90 Select Dataflow

5.) From the Dataflow Name pull-down list, select the dataflow you want to configure - see Figure 3-90.

The selected flow is shown, as seen in the example in Figure 3-91 below (Worklist/Local Archive - DICOM Server/Int. HD).

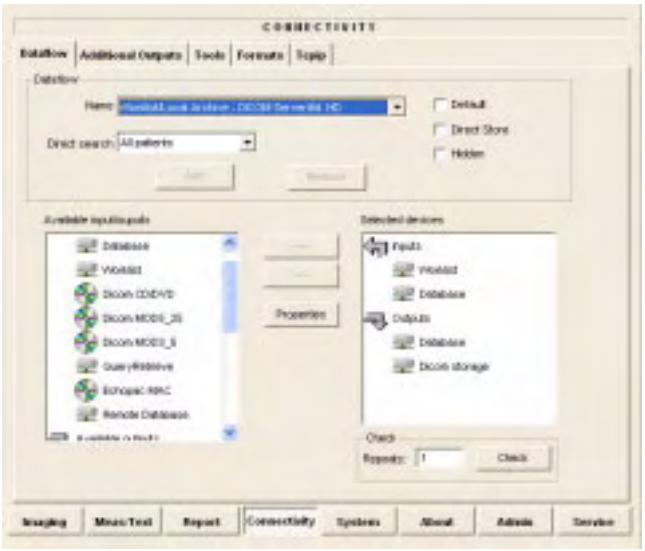


Figure 3-91 Worklist/Local Archive - DICOM Server/Int. HD Flow

6.) Select **Worklist** (so it is highlighted) and then select **Properties** to display the Properties dialog.

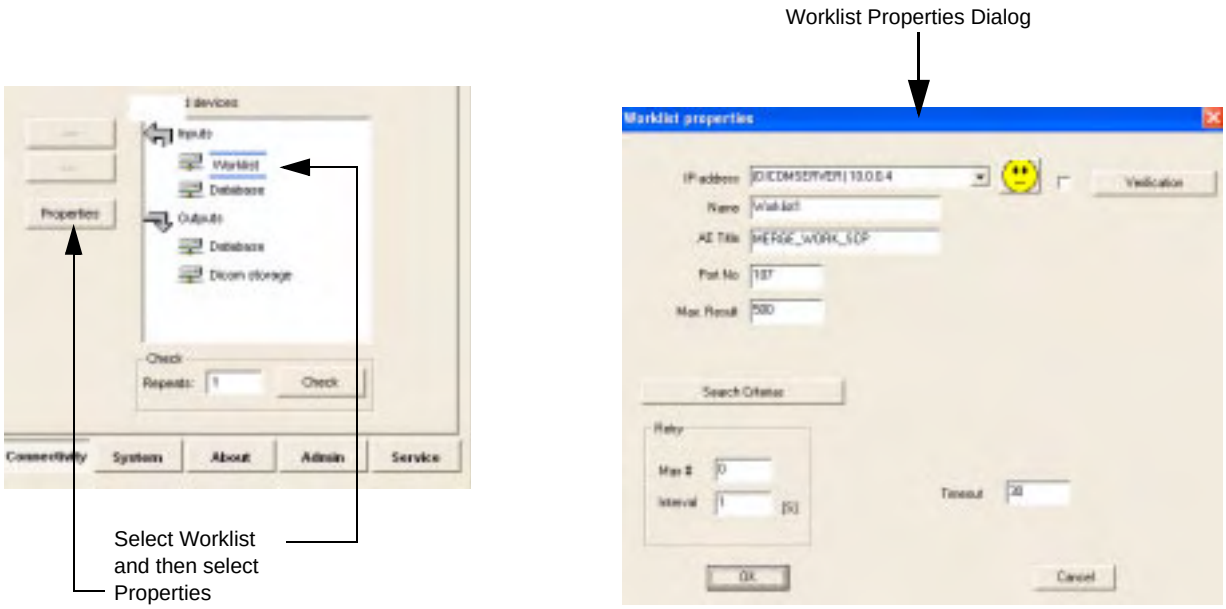


Figure 3-92 Select Worklist Properties Dialog Box

7.) Select the IP-Address down-arrow to choose the Worklist Server from the pull-down menu.

NOTE: It is not possible to change the setting in the IP-Address field by editing it. See description below, starting with step 8, to change the setting.

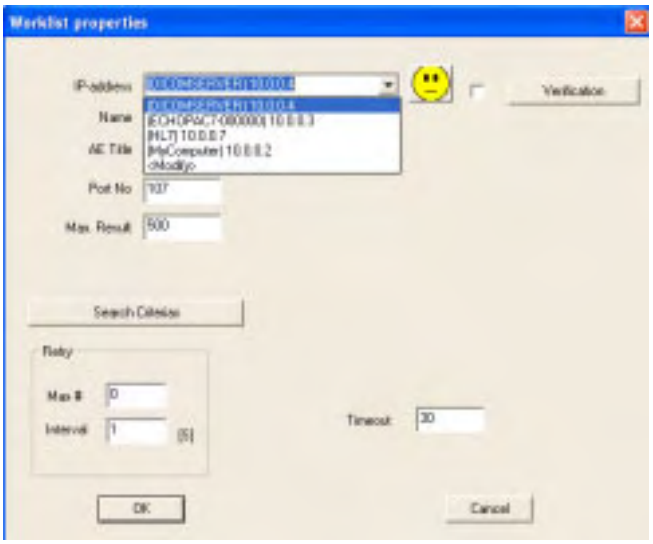


Figure 3-93 DICOM Server's Properties Dialog Box

8.) Follow the steps below to change the IP-Address settings:

a.) From the IP-Address pull-down menu, select <**Modify**> to display the IPs dialog box.

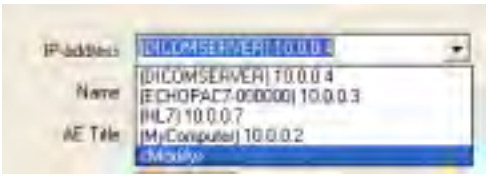


Figure 3-94 Select <Modify>

b.) From the IPs dialog box, select the server you want to modify, then select **Modify**.

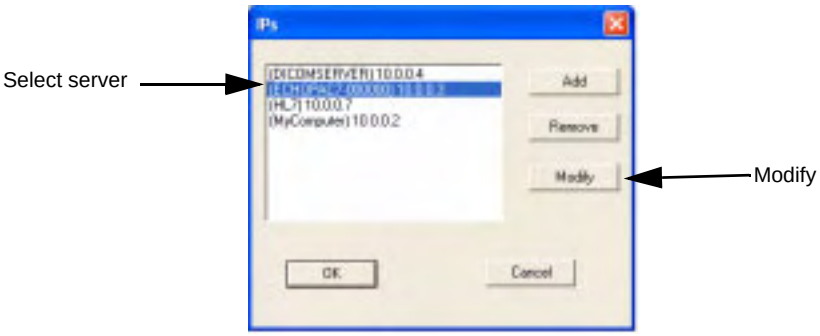


Figure 3-95 Select the Unit to Modify

c.) Edit the name and/or the IP address of the server, see Figure 3-96.

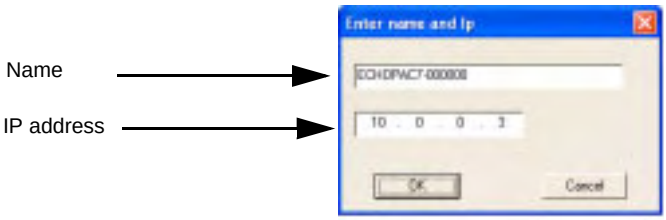


Figure 3-96 Edit Name and/or IP address

d.) Click **OK** to save the new settings and close the Edit Name dialog box.

e.) Click **OK** to close the IPs dialog to return to the Properties dialog box.

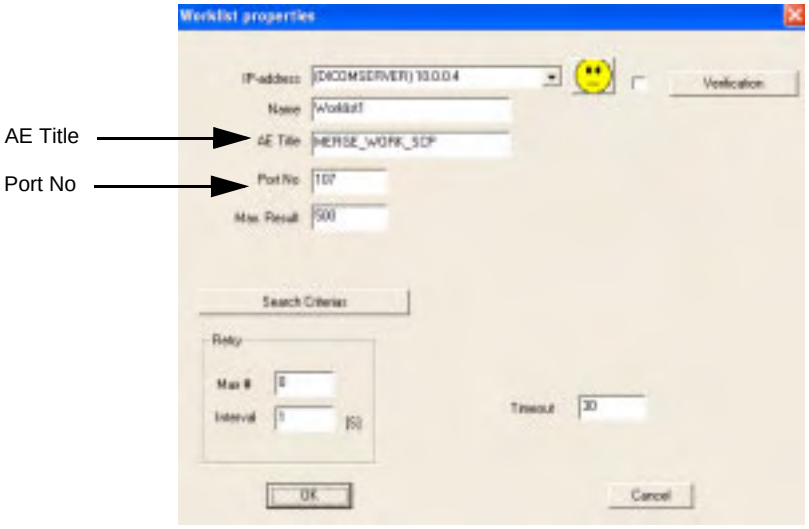


Figure 3-97 DICOM Server's Properties Dialog Box

f.) Enter the DICOM server AE Title. This entry is case-sensitive and must match exactly.

g.) Enter the DICOM server port.

h.) For some DICOM Servers, the default Time-out setting (30) is too low. Change if necessary by typing a new value (seconds).

i.) Click **OK** to close the Worklist Properties dialog box and save the changes.

3-8-4-3 Verify the Connection to a Device

1.) Select (highlight) the device to which you want to verify the connection.

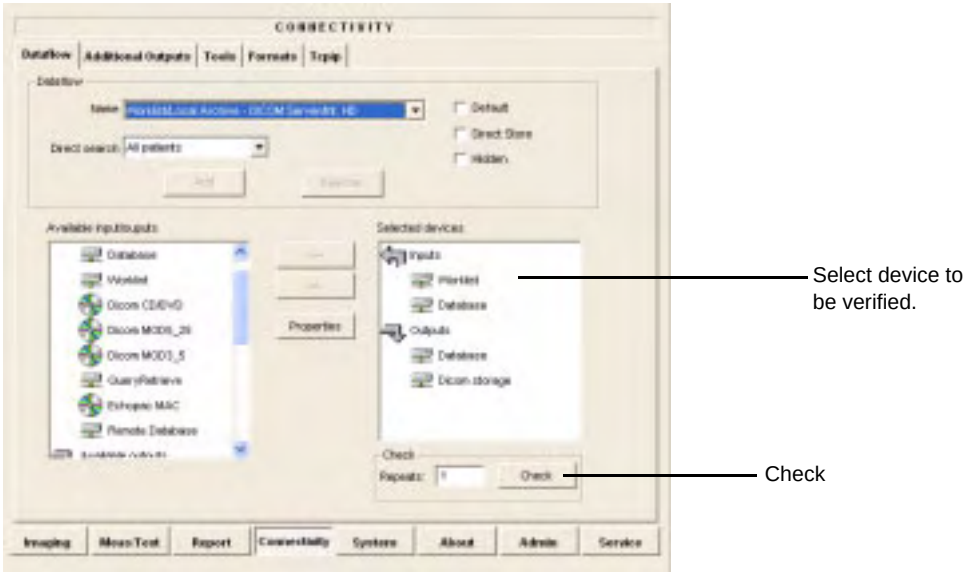
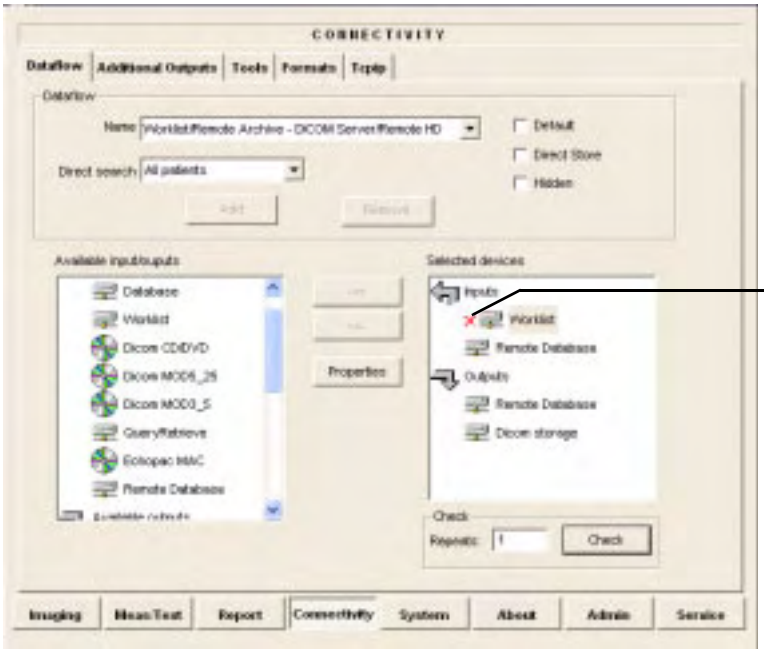


Figure 3-98 Verify Connection to a Device

2.) Select CHECK to start the connection to the device verification process.
The verification process may require up to one minutes. When done, a sign (prefix) displayed in front of the listed device indicates whether the test passed (green check-mark) or failed (red X).



A green check-mark indicates that the test passed.
A red cross (as illustrated) indicates that the connection failed.

Figure 3-99 Verification Result

3-8-5 Setup Connection to HL7 Server in a Network

3-8-5-1 Introduction

The procedures below describe how to set up the Vivid-i™ workstation so it can connect to the Hospital Information System (HIS), via the Vivid HL7 Gateway. By connecting to the HIS, demographic information (i.e. *Patient ID*, *Name*, *Gender, etc*.) can be retrieved from the HIS, reducing “double-work” and typing errors. Patient Reports can be sent back to the HIS for storage, together with the rest of the Patient records.

3-8-5-2 Preparations

1.) Before you can set up the HL 7 Communication, you need to collect some information:

- The IP address of the Vivid HL7 Gateway
- Port Number used by the Vivid HL7 Gateway (Default port: 3320)

Typically, source for this information is the Mitra support personnel.

The Worksheet for DICOM Network Information on page 2 - 12 can be used for gathering this information.

2.) Provide the computer name of each EchoPAC PC Workstation and Vivid-i™ being configured to the Mitra support personnel.

3-8-5-3 Configuration of Modality Worklist Services

Identify Dataflow to be Used

1.) Identify which dataflow is to be used at the site. If the DICOM Modality Worklist will be used, then the dataflow must include a Worklist service.
2.) On the Connectivity screen, select the **Dataflow** tab.
3.) From the pull-down menu, select the name of the site's dataflow.
4.) In the *Services* section, locate the **Worklist** service.
5.) Record the service's name and destination device.

Configure the DICOM Worklist Service

1.) Select the **Services** tab.
2.) Select the Worklist destination device from the pull down menu.
3.) Enter the IP address of the Vivid HL7 Gateway.
4.) Enter a descriptive name in the Name field.
(Example: Vivid HL7 Gateway. The use of this field is optional).
5.) Enter AE Title. Use the Computer Name for the unit you are configuring.
6.) Enter Port Number. (Port 3320 is the default, but Mitra may have provided another port number).
7.) Set Time-out to 90.
8.) Leave the rest of the fields unchanged.

Configure the Search Criterias

NOTE: This configuration is required.

1.) Click the **Search Criterias** button.
2.) Select the criteria **Modality** and click the **Remove** button.
3.) Press the **OK** button.

Configure Search Criteria: Constrain Query by AE Title

NOTE: This configuration is optional. It should only be performed if the site is directing orders to the Vivid-i™ that is scheduled to perform the study.

Please contact the Mitra support personnel to verify that this step is needed.

1.) In the *Search Criterias* dialog box, select **00400001 Scheduled Station AE Title** from the *Select Tag* pull-down menu.
2.) Enter the Vivid-i™ computer name for the Value.
3.) Click the **Add to List** button.
4.) Click the **OK** button.

Configure Search Criteria: Constrain Query by MRN

NOTE: This configuration should be performed if the site will need to constrain the Worklist queries by MRN (patient id)

1.) In the *Search Criterias* dialog box, select **00101000 Other Patient IDs** from the *Select Tag* pull-down menu.
2.) Enter a 9 digit number for the Value.
3.) Click the **Add to List** button.
4.) Click the **OK** button.

Assign DICOM Worklist name to Dataflow

1.) Select the Dataflow tab.
2.) From the *Dataflow name* pull-down menu, select the Dataflow which will be used.
3.) Remove the DICOM Worklist service currently used in the Dataflow.
4.) From the *Select Service* pull-down menu, select the **Gateway Modality Worklist** service.
5.) Click the **Add** button.
6.) Ensure that the service is displaying the value **In** for the Dir parameter and that its role is **Primary**.

Test Connectivity with the Vivid HL7 Gateway

The purpose of this test is to verify that the Vivid-i™ has connectivity with the Vivid HL7 Gateway.

1.) From either the Current or Dataflow view, expand the Dataflow incorporating the Gateway Modality Worklist service.
2.) Expand the Gateway destination device.
3.) Select the **Gateway Modality Worklist** service.
4.) Click the **Check** button.
   - If connectivity was achieved, then a green check should be displayed next to the name of the Gateway's Modality Worklist service.
   - If connectivity was not achieved, then there will be a red X next to the name of the Gateway's Modality Worklist service.

Troubleshoot Connectivity with the Gateway

If connection between the Vivid-i™ and the HIS failed, the following are typical causes:

1.) No network connection.
2.) IP address and/or port number was incorrectly entered when configuring the Gateway Modality Worklist service.
3.) Mitra support personnel have not yet configured the Gateway to accept Modality Worklist queries from the Vivid-i™.

Verify that the Vivid-i™computer name matches the value specified for the Gateway Modality Worklist service and that it also matches the value supplied to the Mitra support personnel.

Configure the Export to HL7 Path

1.) Enter the configuration screen for the EchoPAC PC.
2.) Press the **Connectivity** button.
3.) Select the **Tools** tab.
4.) In the section labeled *Export Paths*, make the following changes:
   a.) For the Export To HL7 path, enter the following information:
   \\ < Name or IP Address of the Vivid HL7 Gateway>\POLL_DIR
   Example: \\Gateway\POLL_DIR
   b.) Verify that Text is select for the Export file format.

Test Connectivity with the Vivid HL7 Gateway

1.) Start a new study and acquire an image, or use an existing study.
2.) In the Measurements mode, make some of the measurements.
3.) In the Report screen, create and store a report.
4.) In the Patient screen, from the Examination List, select the study in which you created the report.
5.) From the *More* pull-down menu, select **HL7 Results**.

   If the export was successful, the following message is displayed:
   Export exam status: OK.

   If the export was unsuccessful, the following message (or similar) is displayed:
   Export exam status: Unable to copy file.

Troubleshoot Connectivity with the Vivid HL7 Gateway

If Connectivity with the Vivid HL7 Gateway failed, the following are typical causes:

1.) Path provided in Export to HL7 export path was incorrect.
2.) Mitra support personnel did not create the user account for the Vivid-i™.
3.) The POLL_DIR directory on the Vivid HL7 Gateway was not shared or the permissions are incorrect. Verify with Mitra support personnel.
4.) Domain or other network issue.
5.) If Report files (ReportXXX.chm) are not exported to the Vivid HL7 Gateway, then the reports may not have been stored when they were created on the Vivid-i™.

3-8-6 Query/Retrieve (Q/R) Setup

3-8-6-1 Overview

The Query/Retrieve function makes it possible to search for and retrieve DICOM data from a DICOM server for further analysis on the Vivid-i™.

3-8-6-2 Query/Retrieve Setup on the Vivid-i™

1.) Press **CONFIG** (**F2**) and log on as *Adm*, as described in Log On to the System as ADM on page 4 - 11

2.) Select **Connectivity**.

3.) Select **Dataflow**.

4.) Select **Query Retrieve** from the *Name* pull-down menu - see Figure 3-102 on page 3-102.

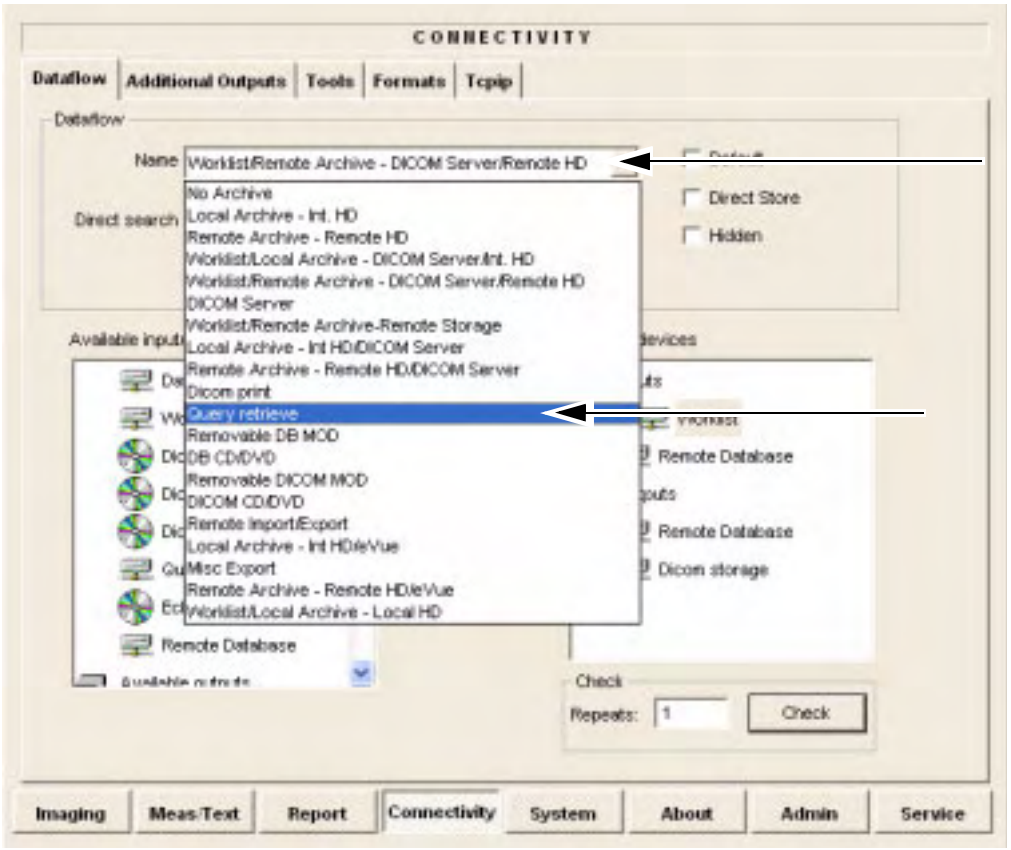


Figure 3-100 Select Query Retrieve

The selected dataflow (Query/Retrieve), is displayed as shown in Figure 3-101.

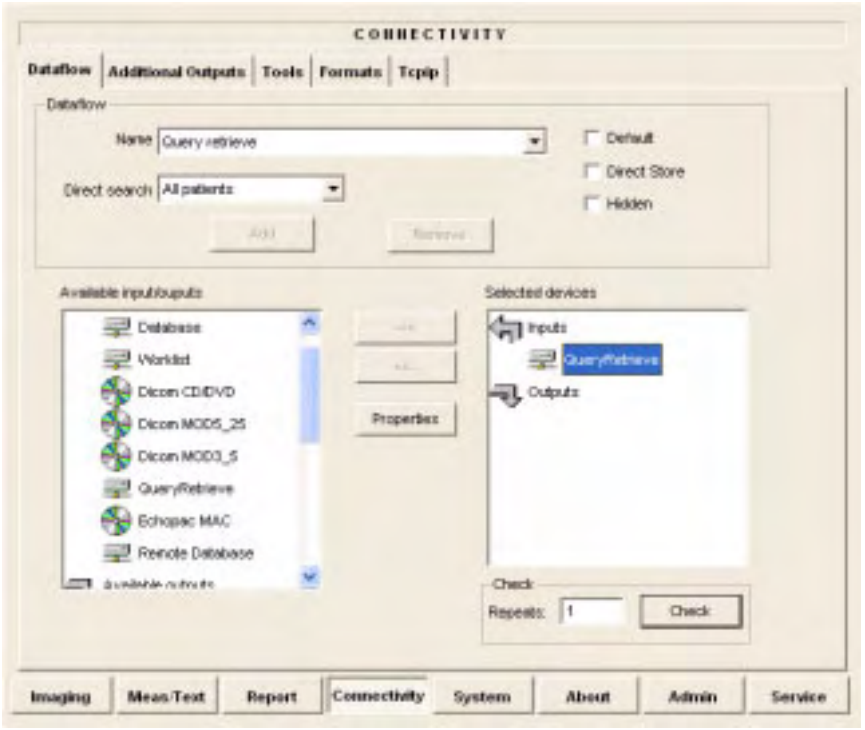


Figure 3-101 Query/Retrieve Workflow

5.) Select **QueryRetrieve** so it is highlighted and then select **Properties** to display the Properties dialog box.

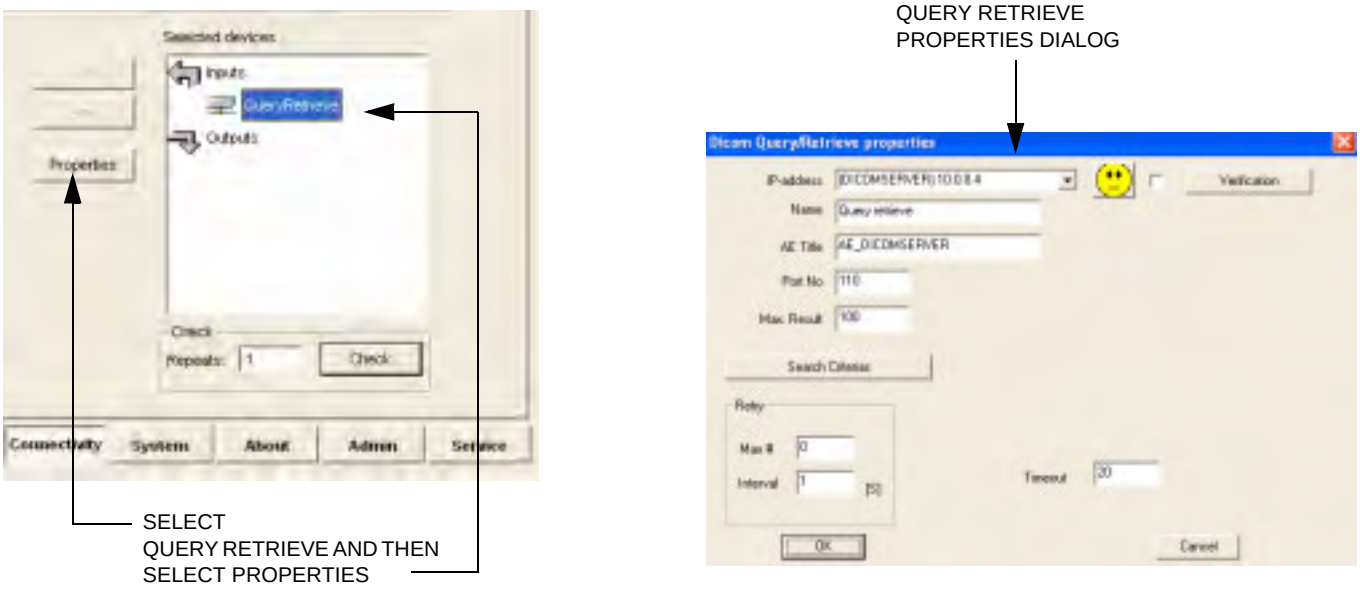


Figure 3-102 Select Query/Retrieve's Properties

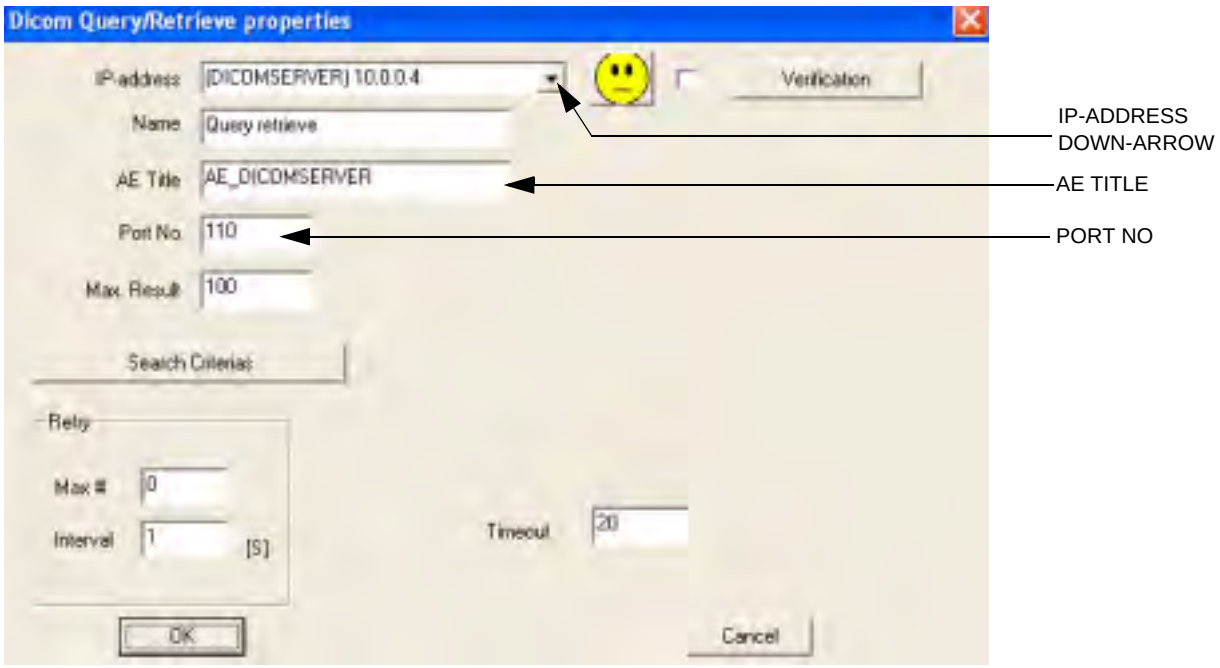


Figure 3-103 DICOM Query/Retrieve properties

6.) Select the IP-address down-arrow to choose the DICOM Query/Retrieve server from the pull-down menu. In some cases, the server to use is the same as used for DICOM Storage.

If the server to use is missing from the list, select <**Modify**> from the pull-down menu and edit the setup for one of the predefined servers.

7.) Enter the correct AE Title and Port Number for the DICOM Query/Retrieve server in the respective fields in the Query/Retrieve screen.

Change Search Criterias

It is possible to set up special Search Criterias for DICOM Query/Retrieve. In most cases you may leave the Search Criterias as is, and skip this adjustment.

Follow the steps below to change the Search Criterias parameters:

1.) Select Search Criterias

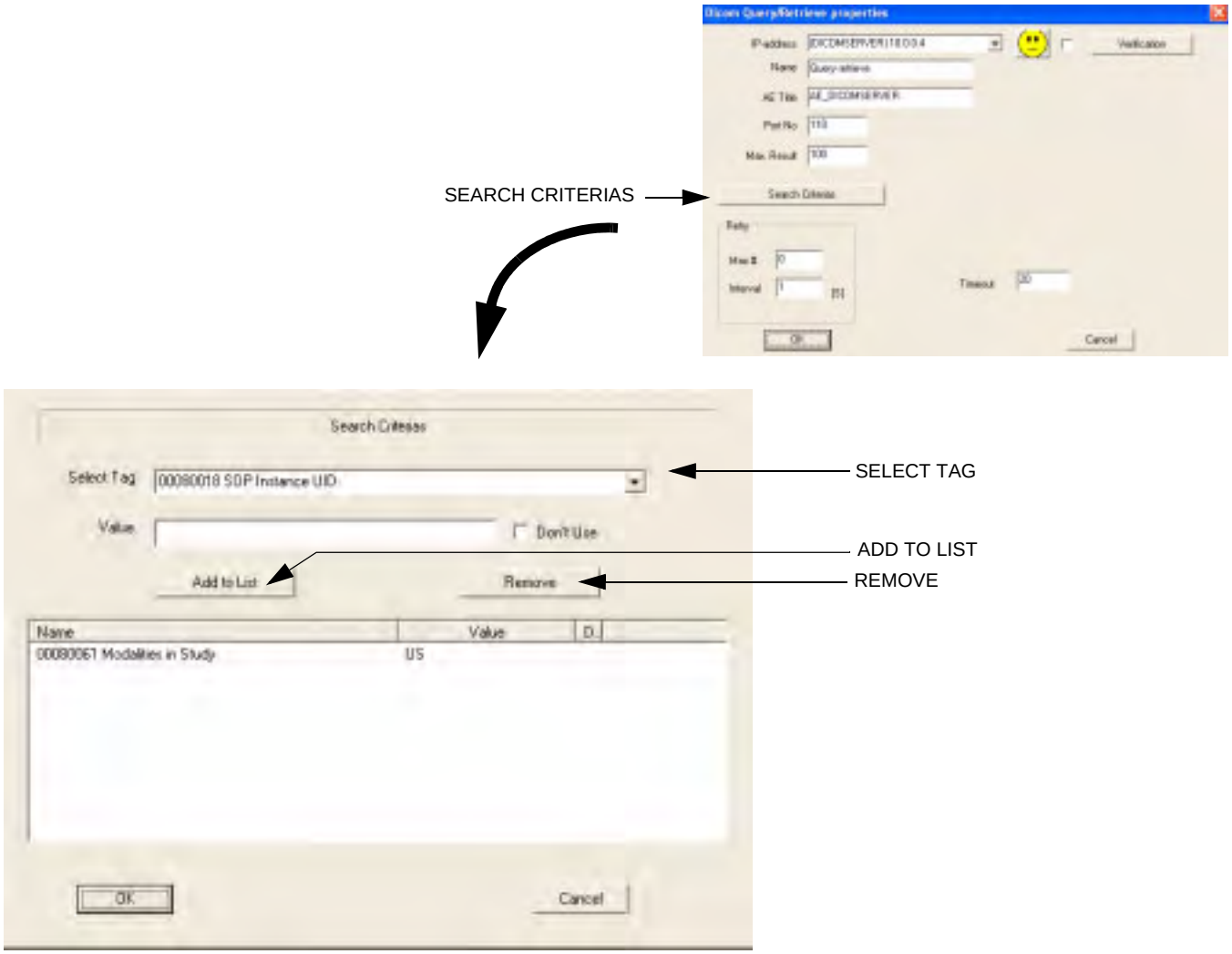


Figure 3-104 Select Search Criterias

2.) Select the correct tag from the *Select Tag* pull-down menu.
3.) If needed, type in the value.
4.) Select **Add to List**.
5.) Click **OK** to close the Search Criterias window.

3-8-6-3 Query/Retrieve Verification

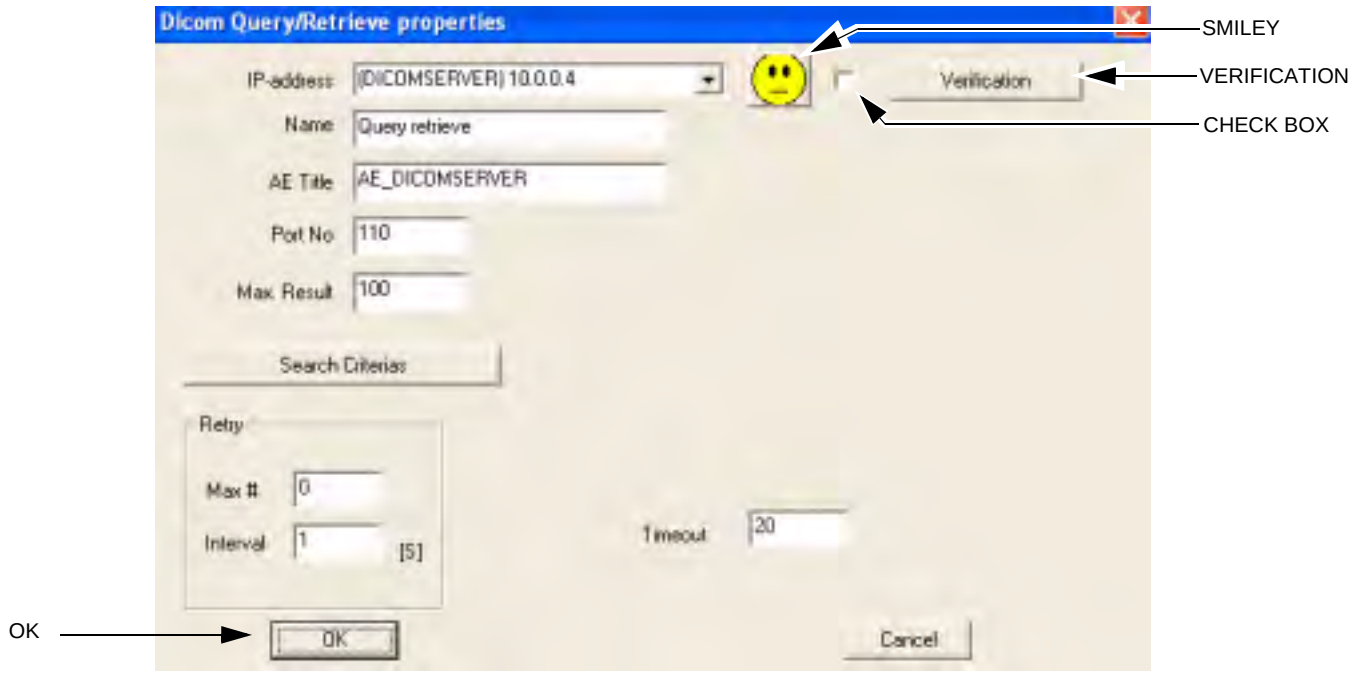


Figure 3-105 DICOM Query/Retrieve Properties

Follow the Steps Below to do a First Test (Ping) of the Connection

1.) Select the Smiley button to Ping the server.

2.) If the network connection to the server is OK, it will be illustrated by a smiling Smiley .
A sad Smiley indicates that the network connection is failing.
Typical cause: Network cable not connected.

3.) When ready, click **OK** to close the DICOM Query/Retrieve properties and save changes.

Follow the Steps Below to Test the DICOM Query/Retrieve Workflow

NOTE: This check uses both Ping and DICOM Ping.

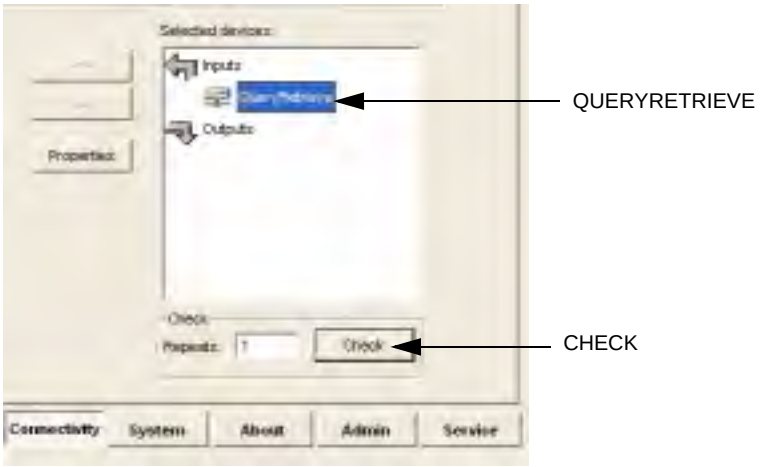


Figure 3-106 Check the DICOM Query/Retrieve Workflow

1.) Select **QueryRetrieve** from the Selected devices list.

2.) Select **Check**.

- If the test passes, a pop-up dialog is displayed, see left illustration in Figure 3-107.

  Select **OK** to continue. A green check mark to the left of the Selected devices indicates that the test passed successfully.

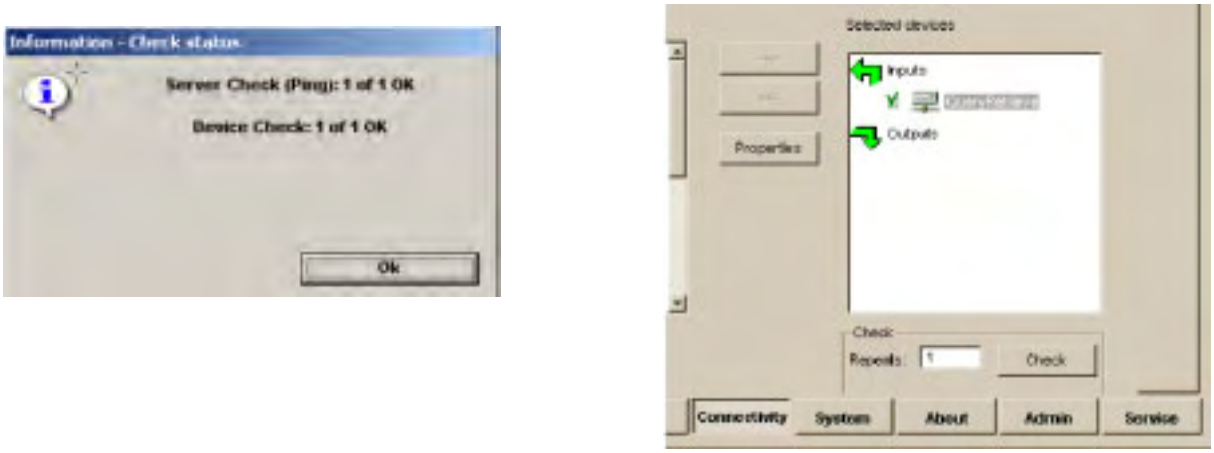


Figure 3-107 Test (Check) Passed

- If the test fails, a pop-up warning is displayed, see left illustration in Figure 3-108.

  Select **OK** to continue. A red “X” to the left of the Selected devices indicates that the test failed.

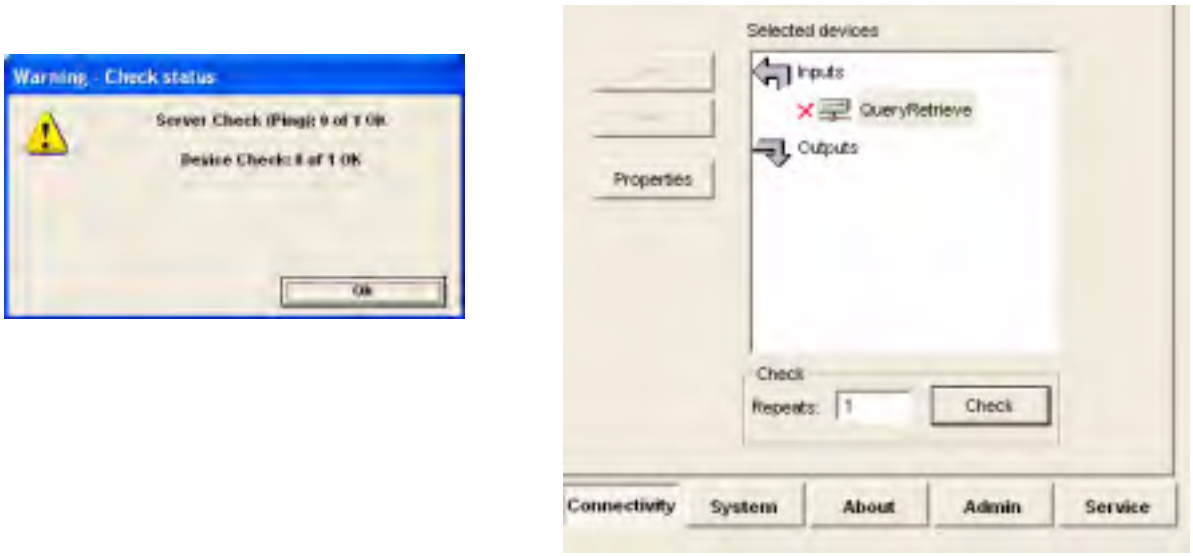


Figure 3-108 Test (Check) Failed

3-8-7 MPEGVue Export Configuration

3-8-7-1 Introduction

The procedures below describe how to set up the Vivid-i™ portable ultrasound scanner for MPEGVue export. This provides the user with the ability to export an entire patient exam into standard supported media (such as, CD, DVD, or USB Memory Stick [disk-on-key]) in standard MPEG or JPG format. The exported exam can later be read on any PC.

Media containing one or several patient exams in MPEGVue format is easily generated on the Vivid-i™. When exporting data from the system for this purpose, the exported examination contains files in HTML, MPEG and JPG formats for all of the images in the exam. It also contains measurements and reports generated and saved during the exam; the reports are all saved as files in .CHM format.

Any media generated as MPEGvue also contains an embedded MPEGVue viewer, allowing the user to view it on any PC without having to install any additional software.

The exported exam may be viewed on any PC operating on Windows 2000, 2003 or Windows XP. This can prove useful in many situations - for example, when sending patient data for a second opinion, for academic lectures, conferences, presentations, *etc*. Another way of using this feature is to directly provide the patient with an MPEGVue disk (CD or DVD) containing, for example, an OB exam.

3-8-7-2 Preparations

Obtain local IP addresses that will allow you to set up the system and the remote computer properly. This information is available from the local system administrator.

3-8-7-3 Configuring the Vivid-i™ for MPEGVue Export

1) Press the **Config** (or **F2**) button and log on as *Adm*, as described in Log On to the System as ADM on page 4 - 11.

2.) Select **Connectivity**.

3.) Select **Dataflow**.

4) From the drop-down menu, select **Misc Export** - see Figure 3-109.

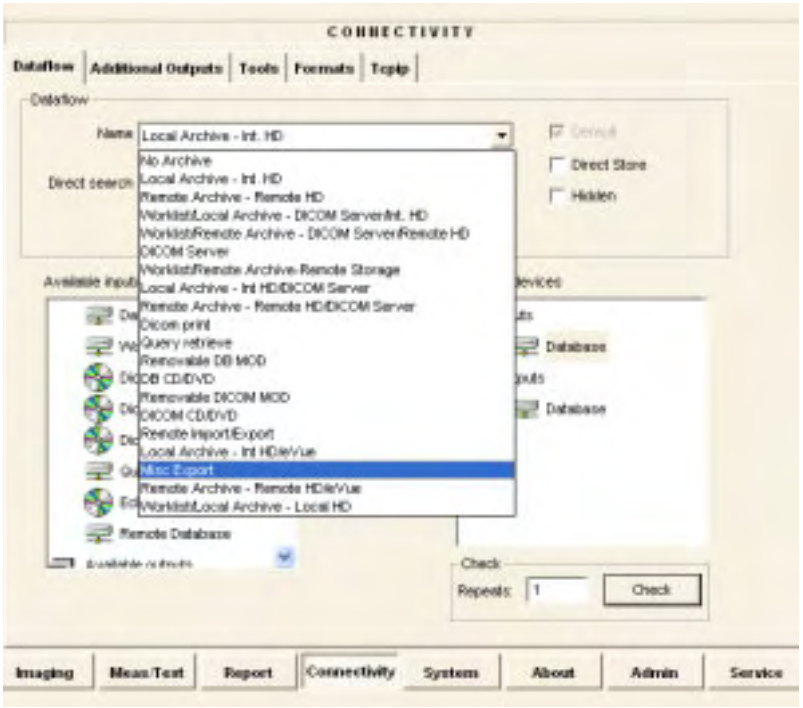


Figure 3-109 Dataflow - Misc Export

5) From selected output devices, highlight **evue** and then click the **Properties** button - refer to Figure 3-110 on page 3-109.

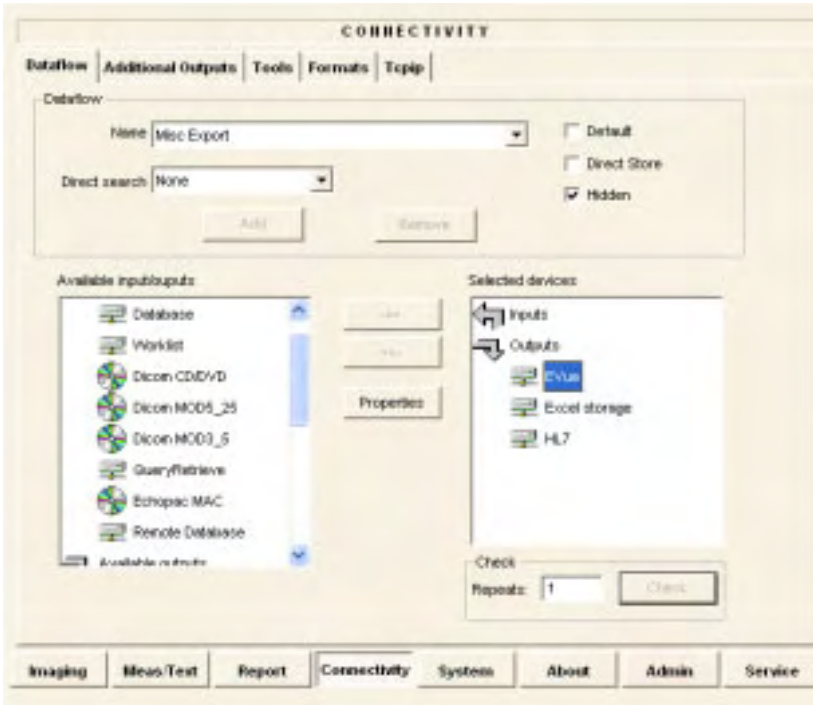


Figure 3-110 eVue Properties

The eVue Properties Dialog box opens:

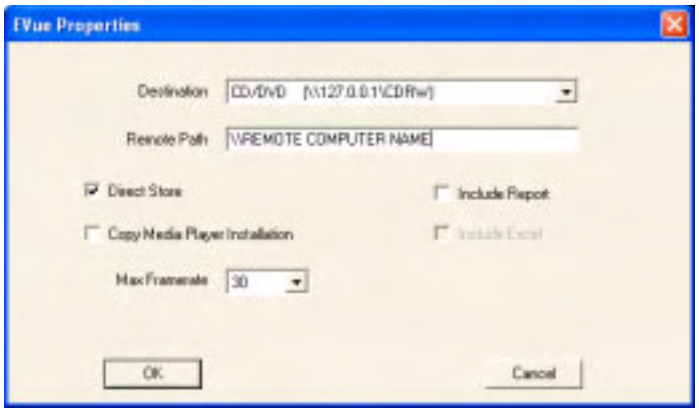


Figure 3-111 eVue Properties Dialog Box

6) In the *Remote Path* field, type in the path to which you want to export MPEGVue (when this feature is used).

Note: If the destination is a constant IP, you can type either the remote computer name or the remote computer's ID address in the *Remote Path* field.
After the path has been typed, it is available for selection from the Dataflow Name drop-down menu (or you can select an existing path from this menu).

7) Activate the **Copy Media Player Installation** check box.

Note: Step 7 is recommended for the first transfer of MPEGVue files. This step is not needed for Windows XP. After initial transfer of MPEGVue, it is recommended to disable this check box.

3-8-7-4 Exporting to MPEGVue

When exporting to MPEGVue, the Media can be one of the following supported types:

- CD
- MOD
- USB Memory stick (disk-on-key)

1.) Insert the required media into the appropriate drive (or USB port), when applicable.
2.) From the main screen, trackball to the **Patient** button and press **SET**.
3.) End the current exam (if still open), and select **Patient-List**.

The Patient List will be displayed with the following header:

4.) Trackball to the **Export** softkey in the bottom menu shown below and press **SET**.

The Export dialog box opens.

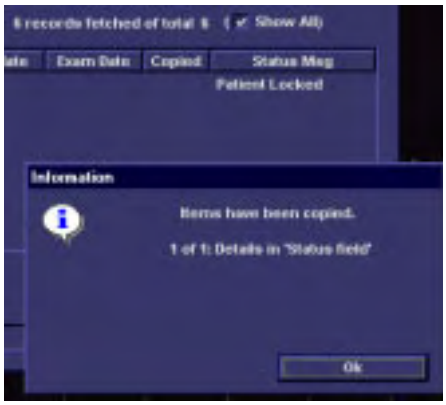
Figure 3-112 Export Dialog Box

5.) Under Export *To*: select **To MPEGvue** in the combo-box on the right, as shown in Figure 3-112.
6.) Click **OK**.

The Patient List screen is displayed with the following header:

7.) Trackball to the required Patient File and select it by pressing **SET**.
To select more than one Patient File from list, use the <Shift> key together with **SET**
8.) When ready, after the required Patients Files have been selected (highlighted,) press the **COPY** button.

The selected files will be converted and copied into the selected media. When done, the following message is displayed:



9.) If required, click **OK** then select any additional Patient Files for export.

10.) When export complete, click **OK** then remove the media containing the exported MPEGVue data from the Vivid-i™ system.

Note: If any problems occurred with copying the Patient Files during the export process, an error message such as the one below will be displayed, showing the status of each of the transferred Patient Files.

3-8-8 eVue Dataflow Configuration

3-8-8-1 Introduction

It is possible to configure the Vivid-i™ portable ultrasound scanner to allow the user to send images or loops to a remote PC, in almost real time. When pressing Store, the loop will save not only to the local archive (in raw-data format), but will also be transmitted to a designated PC ("e-Vue PC") on the network (in compact MPEG format), and will appear at the review PC within a very short time.

This feature proves very useful in the OR scenario, where consultation with another doctor in the hospital ***in real-time*** is required.

3-8-8-2 Preparations

Before configuring the Vivid-i™ for eVue dataflow, it is necessary to decide upon a specific PC in the hospital as being the e-Vue PC station. The service technician then configures the Vivid-i™ to send images to that specific e-Vue PC, as described below.

3-8-8-3 Configuring the Vivid-i™ for eVue Dataflow

1.) Verify which PC in the hospital/institute has been designated as the e-Vue station.

2.) Make sure the Vivid-i™ is connected to the Network via cable or wireless.

3.) On the Vivid-i™ scanner, press the **Config** button.

The System Configuration window opens.

4.) Click **Connectivity**.

The Connectivity dialog box opens.

5.) Select the **Dataflow** Tab, as shown in Figure 3-113 on page 3-113.

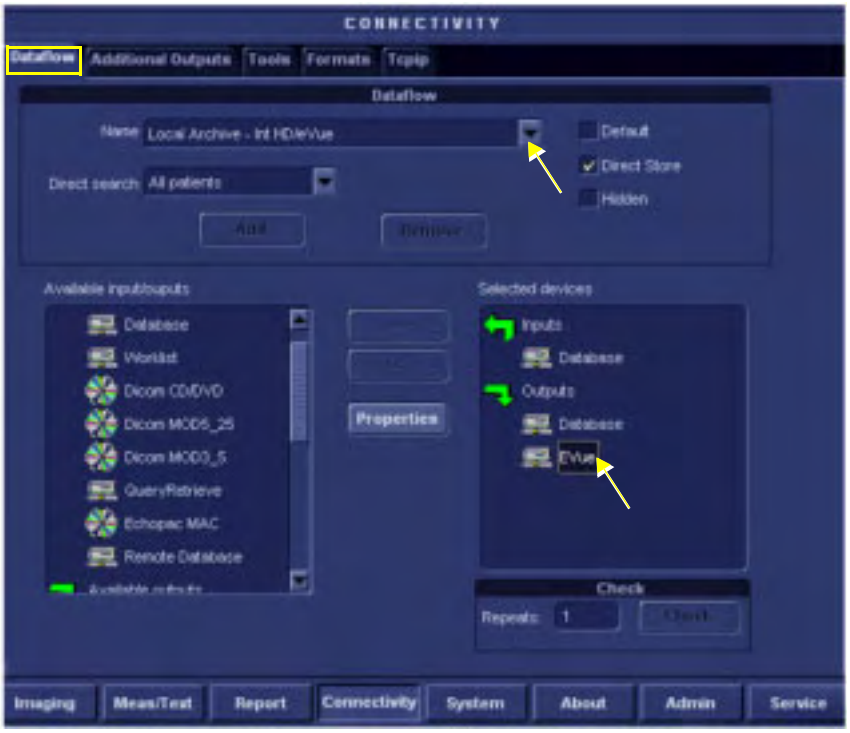


Figure 3-113 Connectivity - Dataflow Tab Selected

6.) Click on the **Name** field to access the drop-down menu.

7.) From drop-down menu, select the Dataflow named **Local Archive – Int. HD/eVue**.

8.) Trackball to the *Selected devices* window and select (highlight) **eVue** (see Figure 3-113).

9.) Trackball to the **Properties** button and press **SET**.

The eVue Properties dialog box opens.

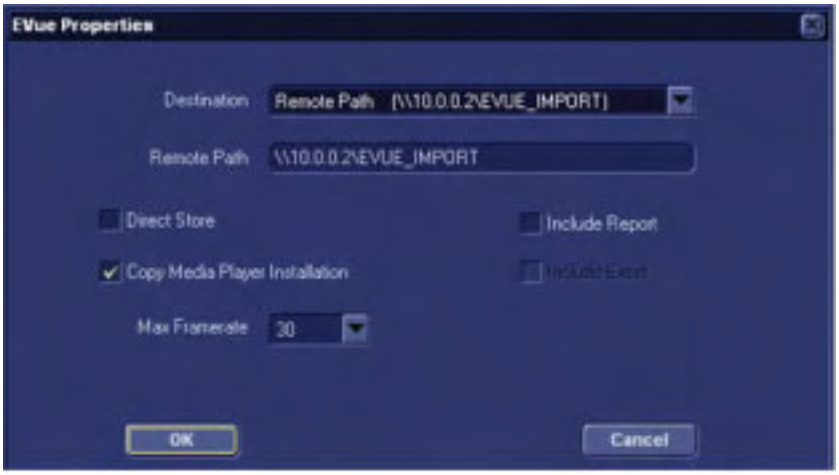


Figure 3-114 eVue Properties Dialog Box

10.) Trackball to the *Remote Path* field and type in the IP address and path of the remote computer: **\\10.0.0.2\EVUE_IMPORT**, or type in the remote computer full name **\\Name\EVUE_IMPORT** (refer to Figure 3-114).

11.) Trackball to the *Destination* field, open the drop-down menu and select **Remote Path (\\10.0.0.2\EVUE_IMPORT)**, or the computer name **\\Name\EVUE_IMPORT** (refer to Figure 3-114).

12.) Activate the **Copy Media Player Installation** check box.

Note: Step 12 is recommended for the first transfer of eVue files. This step is not needed for Windows XP. After initial transfer of eVue, it is recommended to disable this check box.

The Vivid-i™ dataflow is set and ready for export/import of eVue files into a network computer.

From now on, whenever the Vivid-i™ is used for scanning and the **Store** button is pressed, another person will be able to view the stored loop on the remote e-Vue PC (after a short transmission time). When new loops arrive, the following message will be displayed at the bottom of the screen: "*New images have arrived - To view please refresh the screen using F5".*"

3-8-8-4 Using eVue

1.) On the Vivid-i™ portable ultrasound scanner, in regular scanning mode, press **Patient**.

When the following window is displayed, select **Create New Patient**.

The Search/Create Patient dialog box opens.

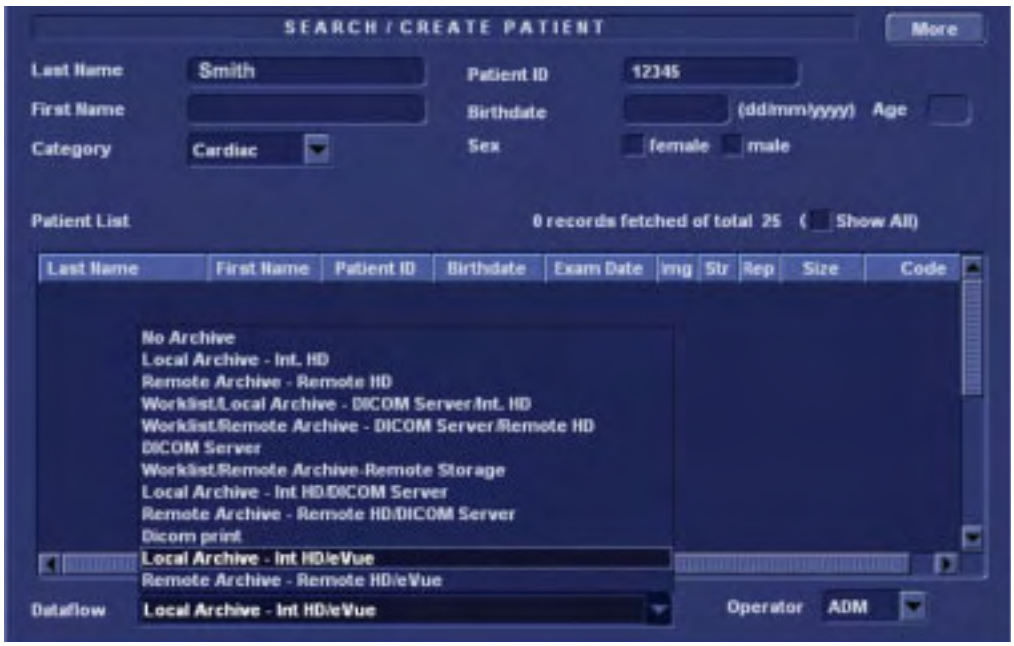


Figure 3-115 Search/Create Patient Dialog Box

2.) Type the patient's Last Name and ID in the appropriate fields (see Figure 3-115).

3.) Select the Dataflow you intend to use for this patient's information (in this case, select **Local Archive – Int HD/eVue** as shown in Figure 3-115).

4.) Using the soft key buttons, select CREATE PATIENT.

5.) Now start scanning. Each image you would like to store press the STORE button.

A few seconds after the Store button is pressed, images will be transferred into the remote computer (which was previously set as the destination - refer to Figure 3-114 on page 3-113).

6.) To proceed, follow to the instructions as described for Using MPEGVue Viewer on a Remote PC on page 3 - 132.

3-8-9 Using MPEGVue/eVue on a Remote PC

3-8-9-1 Installing MPEGVue on a Remote PC

NOTE: MPGEGVue player is not compatible with Windows 98.

IMPORTANT The MPEGVue player is not compatible with Internet Explorer 7, therefore do not upgrade Internet Explorer on your PC to this version. In the event that an upgrade has already been installed, following the instructions for rolling back to Internet Explorer 6 on Windows XP provided on the Microsoft site, as follows: http://www.microsoft.com/windows/ie/support/default.mspx

When a CD ROM containing MPEGvue exams is placed into a CD drive on a remote PC, it should self-boot within a few seconds and display the Patient List.

The first time this is done on the remote PC there will be a one-time operation where the MPEGvue program will self-install. If the remote PC operating system is Windows XP the installation is automatic and, when completed, the Patient List on the CD will be displayed.

In the event that the remote PC operating system is Windows 2000, the auto-installation will display one of the messages shown below (see Figure 3-116 and Figure 3-117), requesting the user to download and install some drivers.

The requested drivers may be downloaded from the Internet, or, if the CD was pre-configured, those drivers will be located on the MPEGvue CD itself.

In addition to the above, the installation program will test the configuration of the remote PC and will display a message if any component on the computer is not within the required specifications.

Your computer is not configured for MPEGvue...
You have to upgrade one or few standard components of Microsoft Windows that are missing in your configuration.
Please click one of the following links to download and install the Microsoft DirectX8.1 or later component.
If your Windows is Windows2000 - click to the following link to start download.
Microsoft DirectX8.1 component -- For Windows2000
If this version is outdated - please download and install the most current version of DirectX available on Microsoft Web Site.
Your computer is not configured for MPEGvue...
You have to upgrade one or few standard components of Microsoft Windows that are missing in your configuration.
Please click the following link to download and install the Microsoft DirectX8.1 or later component.
Microsoft DirectX8.1 component -- For Windows2000
If this version is outdated - please download and install the most current version of DirectX available on Microsoft Web Site.

Figure 3-116 Download/Installation Message Examples #1

Your computer is not configured for MPEGvue...
You have to upgrade one or few standard components of Microsoft Windows that are missing in your configuration.
Please click the following link to download and install the Microsoft Windows Media Player.
Windows Media Player 9 Series (for Windows2000)
If this version is outdated - please download and install the most current version of Windows Media Player available on Microsoft Web Site
Your computer is not configured for MPEGvue...
You have to upgrade one or few standard components of Microsoft Windows that are missing in your configuration.
Please click the following link to download and install the Microsoft Windows Media Player.
Microsoft WindowsMediaPlayer7.1 (WMP7.1) --- For Win2000
If this version is outdated - please download and install the most current version of Windows Media Player available on Microsoft Web Site.

Figure 3-117 Download/Installation Message Examples #2

3-8-9-1-1 Manually Setting the Network PC for eVue Import

1) On the network computer, create a New User by accessing the Control Panel, as follows:

   a.) Double-click on **My Computer** icon on desktop.

   b.) Double-click on **Control Panel** icon.

2) Double-click on **User Accounts** icon.

The User Accounts dialog box opens:

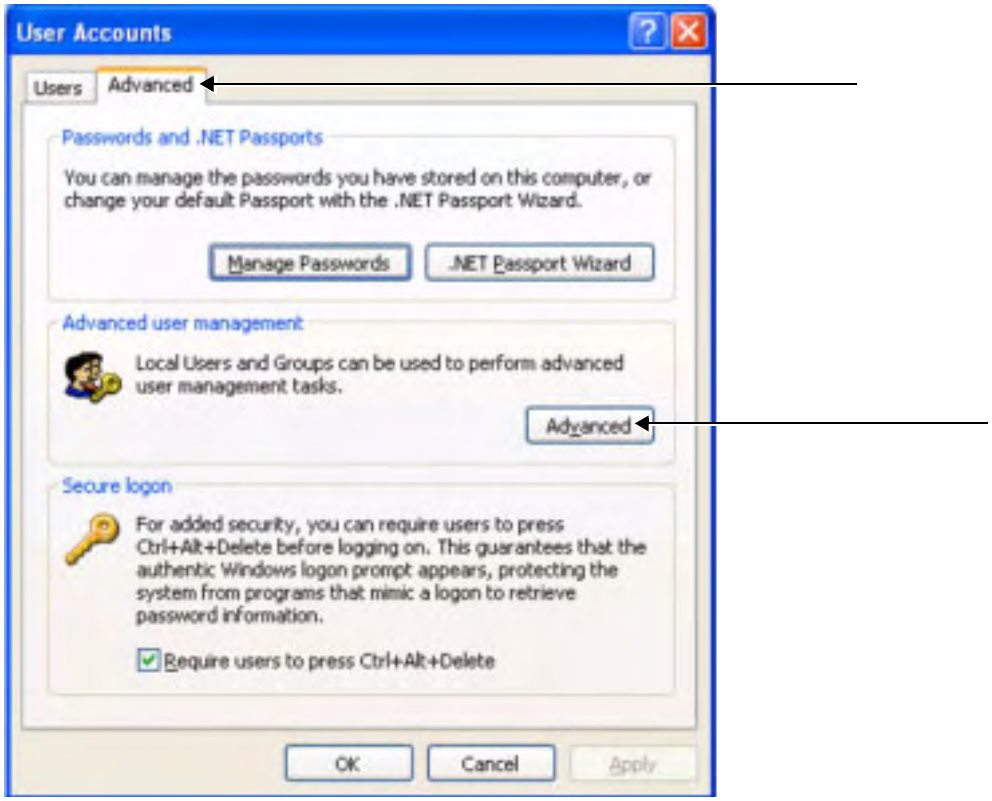

User Accounts
Users
Advanced
Passwords and .NET Passports
You can manage the passwords you have stored on this computer, or change your default Passport with the .NET Passport Wizard.
Manage Passwords
.NET Passport Wizard
Advanced user management
Local Users and Groups can be used to perform advanced user management tasks.
Advanced
Secure logon
For added security, you can require users to press Ctrl+Alt+Delete before logging on. This guarantees that the authentic Windows logon prompt appears, protecting the system from programs that mimic a logon to retrieve password information.
Require users to press Ctrl+Alt+Delete
OK
Cancel
Apply

Figure 3-118 User Accounts Dialog Box

3) Select the **Advanced Tab**.
4) Click on the **Advanced** button.

The Local Users and Groups dialog box opens:

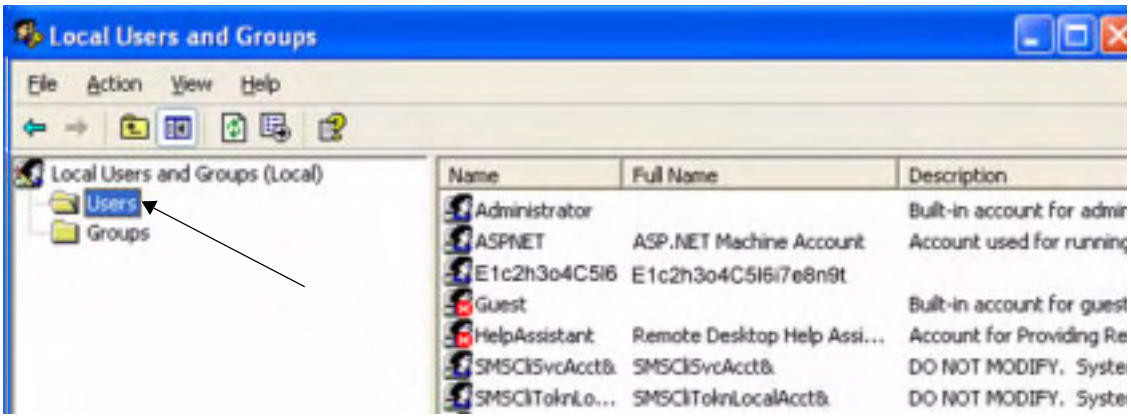


Figure 3-119 Local Users and Groups Dialog Box

5.) Select the **Users folder** and right-click to select **New User**.

The New User dialog box opens:

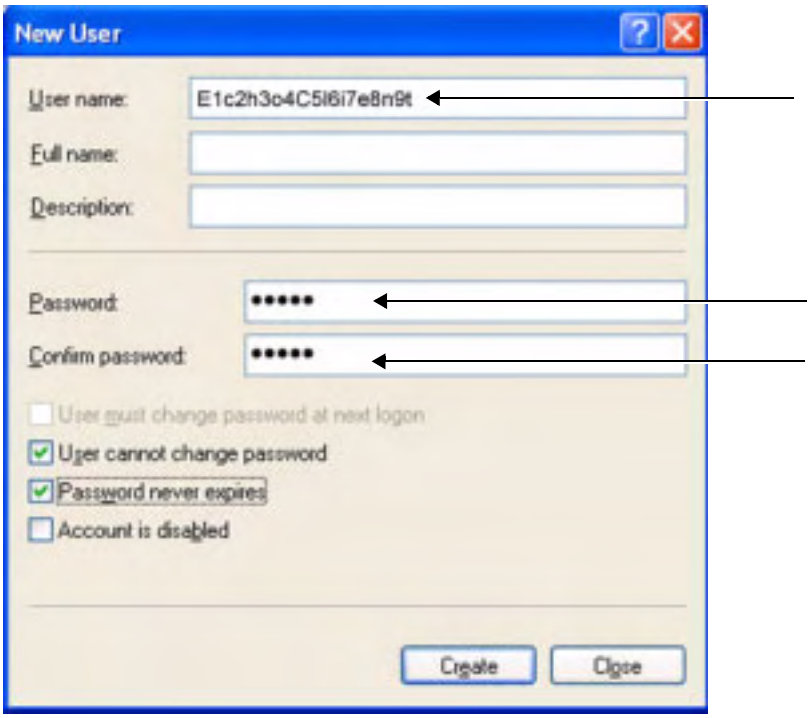


Figure 3-120 New User Dialog Box

6.) Configure a new user account, as follows (see Figure 3-120):

a.) User name: **E1c2h3o4C5l6i7e8n9t**

b.) Password: **u1l3t5r7a**

c.) Deactivate the *User must change password at next logon* check box.

d.) Activate both the **User cannot change password** and **Password never expires** check boxes.

e.) Click **Create** (to confirm setting), and **Close**.

f.) Close all windows.

The new user account has been set and is ready for activation.

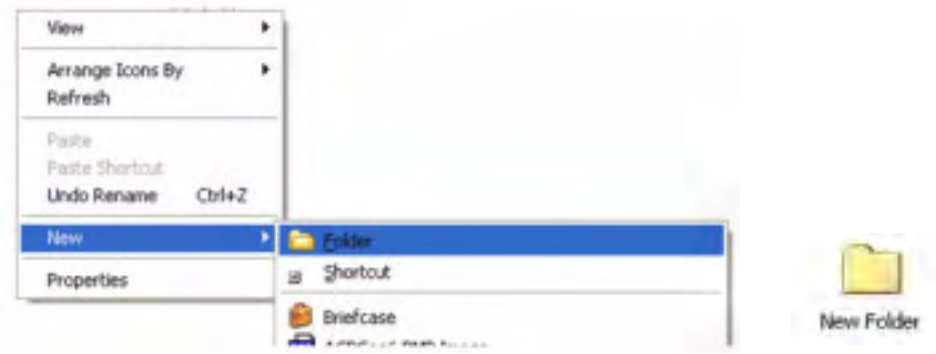
Create a new folder for import/export and set sharing permissions, by proceeding as follows:

7.) On the network computer, double-click on the **My Computer** icon on the desktop.

8.) Under My Computer window select **any local drive** for retrieval of data and create a folder for sharing, as follows:

a.) Under the selected drive, place the cursor in an empty screen region and right-click the mouse.

b.) Now select **New** and **Folder**, to create a new folder:



Important: When more than one scanner is used to export with eVue, it is recommended to configure each scanner with its own folder for exporting files.

c.) Right-click on the New Folder icon and select **Rename**. Rename the folder as **eVue _Import**:

9.) Setting the Sharing properties for the new folder, as follows:

a.) Right-click on **eVue_Import** icon and select **Properties**;

The eVue_Import Properties dialog box opens, as shown in Figure 3-121 on page 3-121.

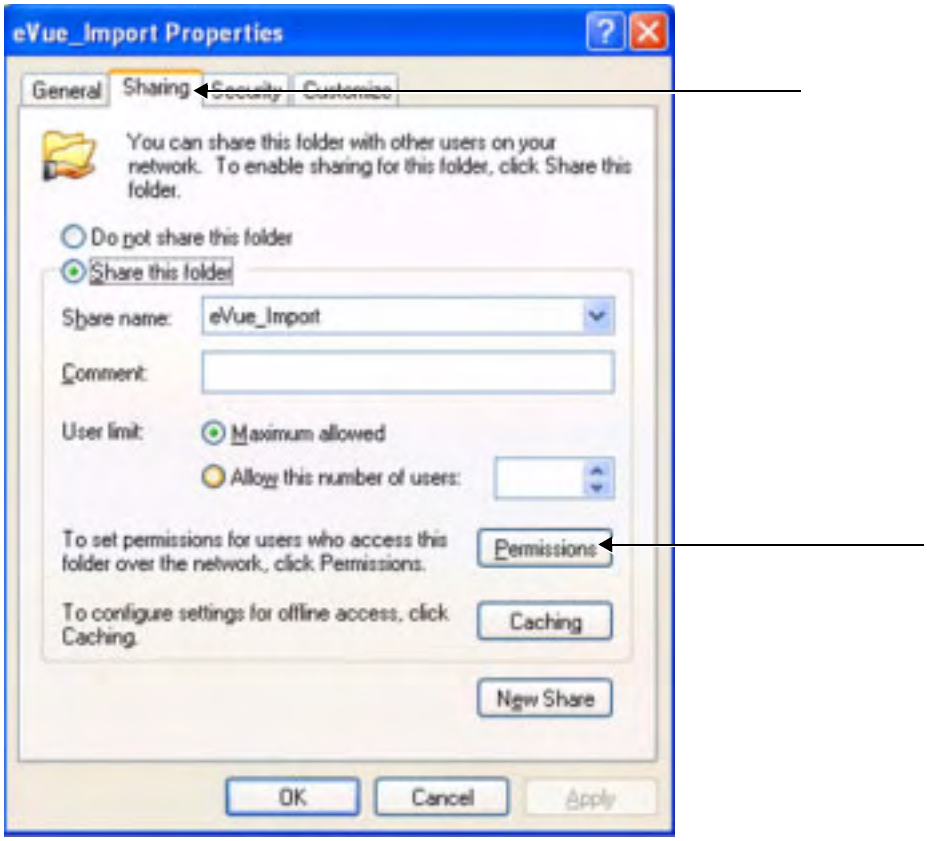
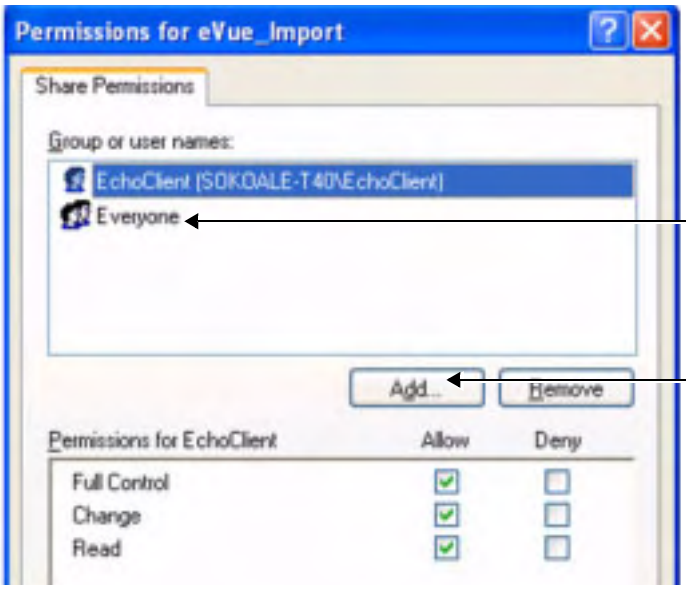


Figure 3-121 eVue_Import Properties Dialog Box

b.) Select the **Sharing Tab**.

c.) Click on the **Permissions** button.

The Permissions for eVue Import dialog box opens:



Note:
It is recommended to remove this user.

Figure 3-122 Permissions for eVue Import Dialog Box

d.) Click the **Add** button.

Note: It is recommended to remove the User **Everyone** from Share Permissions.

The Select Users, Computers, or Groups dialog box opens:

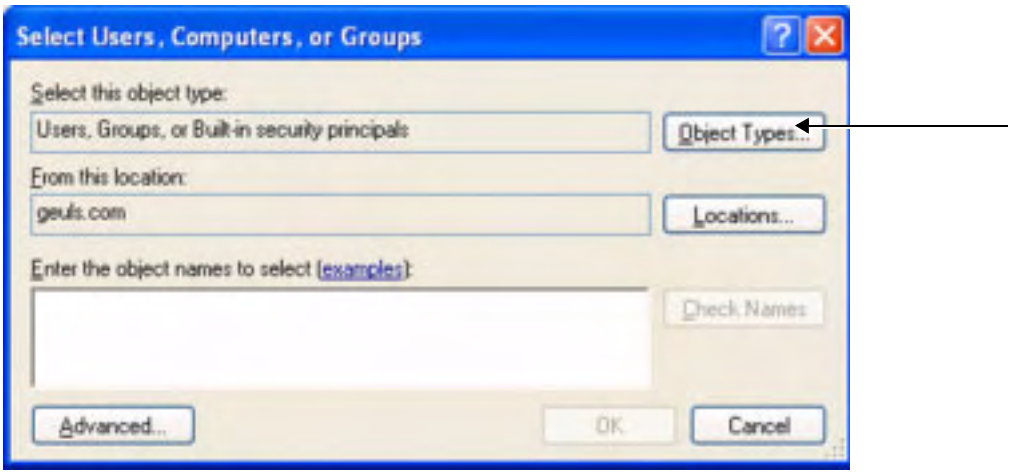
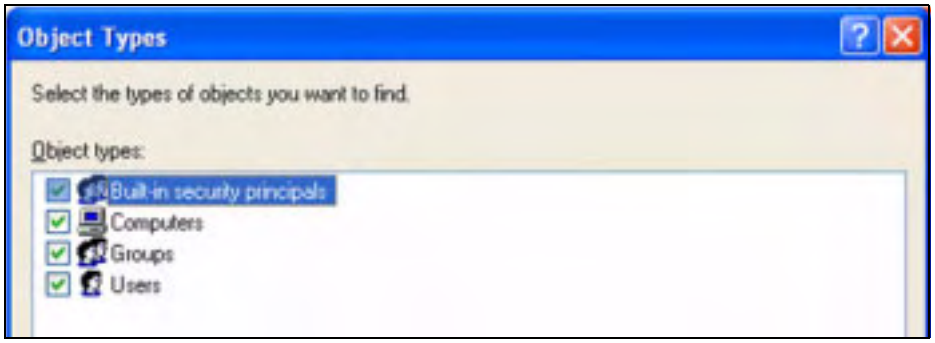


Figure 3-123 Select Users, Computers, or Groups Dialog Box

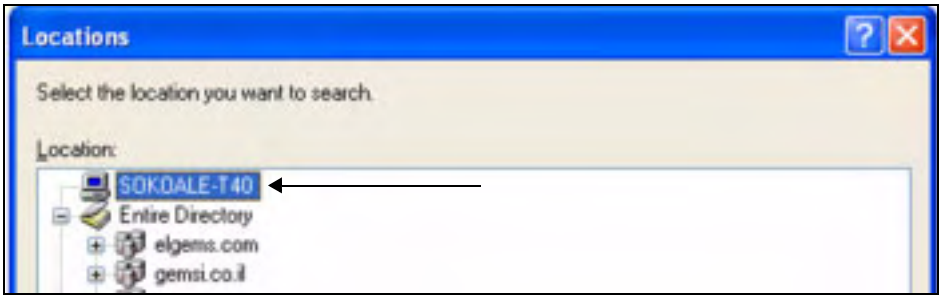
e.) Click the **Object Types** button.

f.) From the Object Types dialog box, select **all** to be active (activate all the check boxes, as shown below) and press **OK**.



g.) From the Select Users, Computers, or Groups dialog box (Figure 3-123), click on the **Locations** button.

h.) In the Locations dialog box, select your **computer** from the list and press **OK**.



i.) In the Select Users or Groups dialog box, type **E1c2h3o4C5l6i7e8n9t** in the empty window, as shown in Figure 3-124.

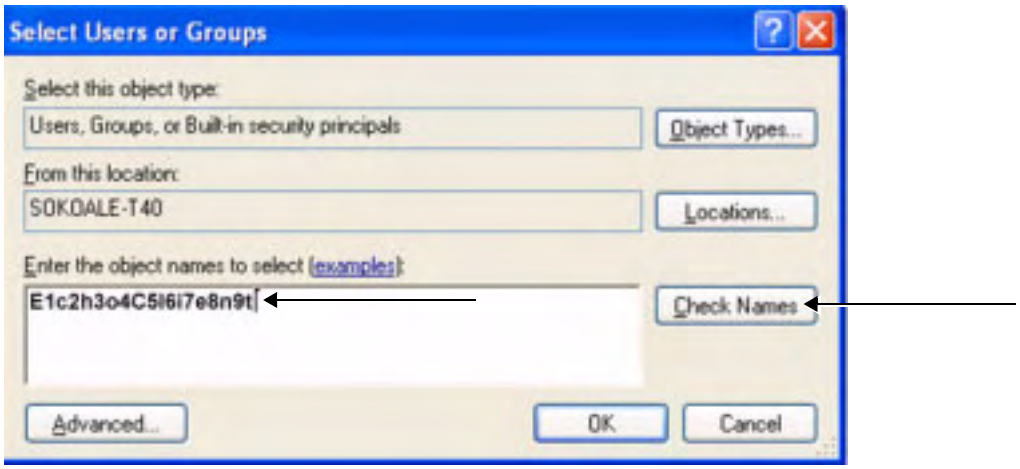
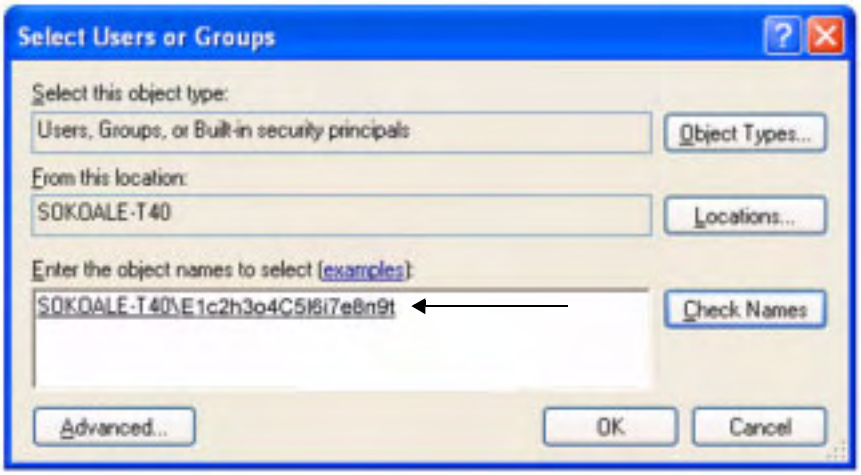


Figure 3-124 Select Users or Groups Dialog Box - Check Names

j.) Click the **Check Names** button.

The name and path will be detected by underlining, as shown below.



k.) Now click **OK**.

l.) From the Permission for eVue_Import dialog box, highlight and select **E1c2h3o4C5l6i7e8n9t** from the list (see Figure 3-125).

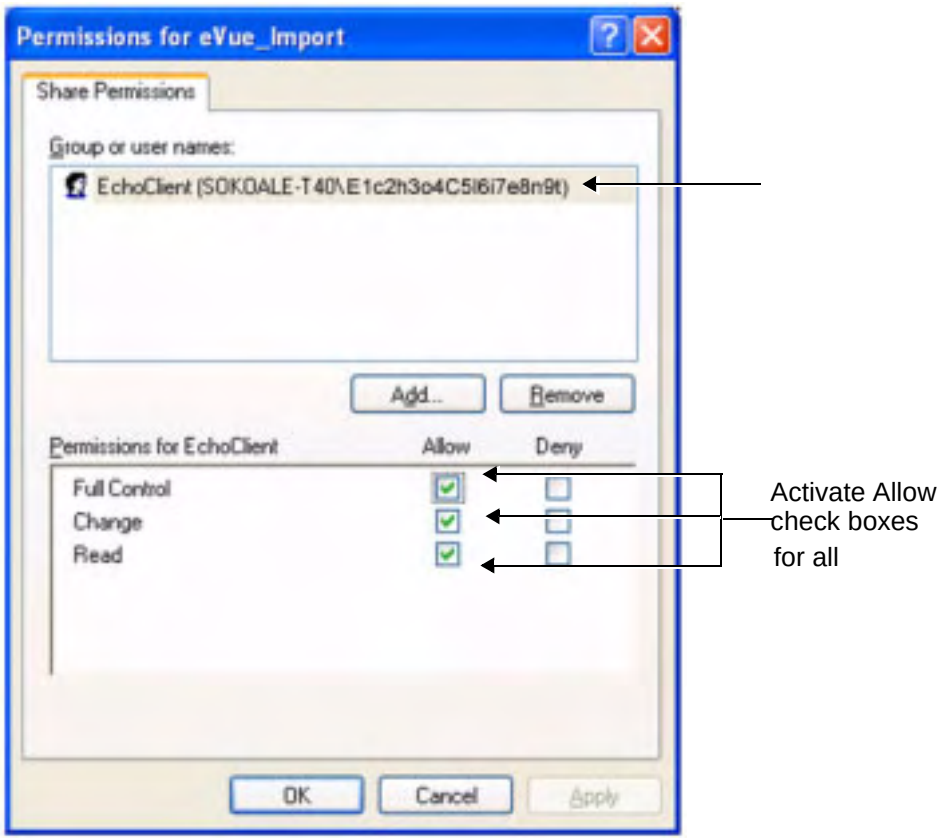


Figure 3-125 Setting Permissions for E1c2h3o4C5l6i7e8n9t

m.) Activate the *Allow* check boxes for all of the following: **Full Control**, **Change**, and **Read**.

n.) Click the **OK** button.

o.) **Close all** windows.

Note: The network computer is now ready to receive files from the Vivid-i™ system. At this stage, set the appropriate path for export of files into the network computer. For example, for eVue, Data Flow or MpegVue export into the network computer using the browsing option to select the appropriate path. For an example of Vivid-i™ dataflow settings, refer to Figure 3-113 on page 3-113.

3-8-9-1-2 Manually Stopping the Firewall on the Network PC

NOTE: In some cases, it is necessary to stop the firewall to allow functions such as Excel export and eVue to access and load files into the Network Computer. The Firewall can be an external service, or part of the Windows Basic Firewall tools.

Stopping the Windows Firewall

1.) On the network computer, access the **Control Panel**, as follows:

a.) Press **Start**.

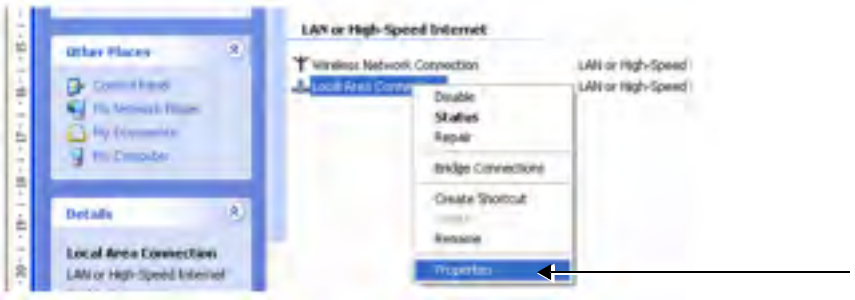
b.) Select **Settings**

c.) Select **Control Panel** from the Menu.

2.) Double-click on **Network Connections** as shown above.

3.) Select your network connection and right-click.

4.) From the drop-down menu, select **Properties**.



The Local Area Connection Properties dialog box opens:

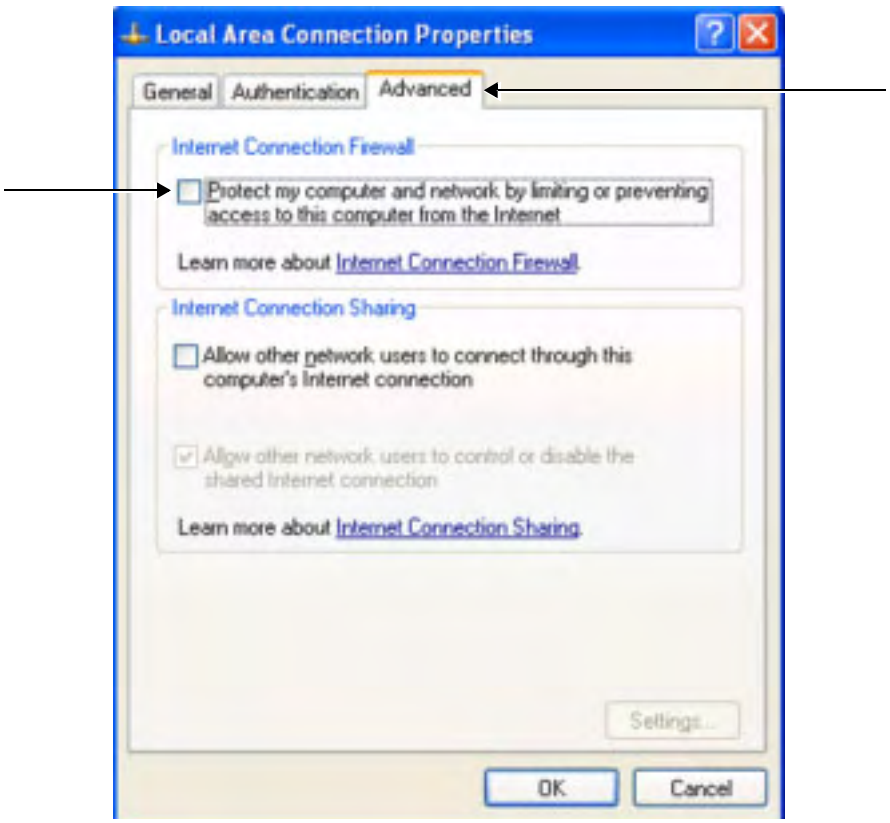

Local Area Connection Properties
General
Authentication
Advanced
Internet Connection Firewall
Protect my computer and network by limiting or preventing access to this computer from the Internet
Learn more about Internet Connection Firewall.
Internet Connection Sharing
Allow other network users to connect through this computer's Internet connection
Allow other network users to control or disable the shared Internet connection
Learn more about Internet Connection Sharing.
Settings...
OK
Cancel

Figure 3-126 Local Area Connection Properties Dialog Box

5.) Select the **Advanced** Tab.

6.) Uncheck the **Internet Connection Firewall** check box, as shown in Figure 3-126.

7.) Click the **OK** button to confirm changes and close all windows.

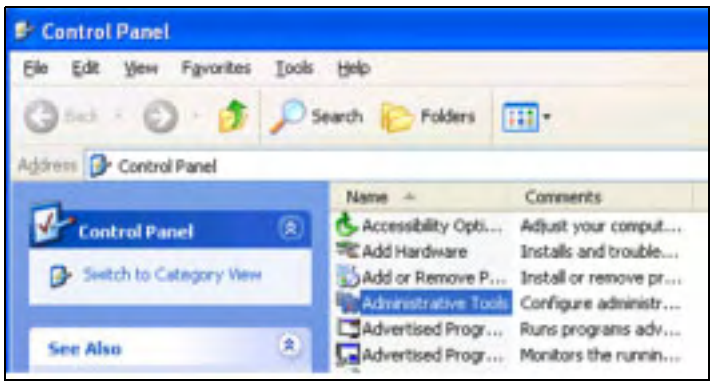
Stopping an External Service Firewall

1.) On the network computer, access the **Control Panel**, as follows:

a.) Press **Start**.

b.) Select **Settings**

c.) Select **Control Panel** from the Menu



2.) Double-click on **Administrative Tools.**

The Administrative Tools dialog box opens:

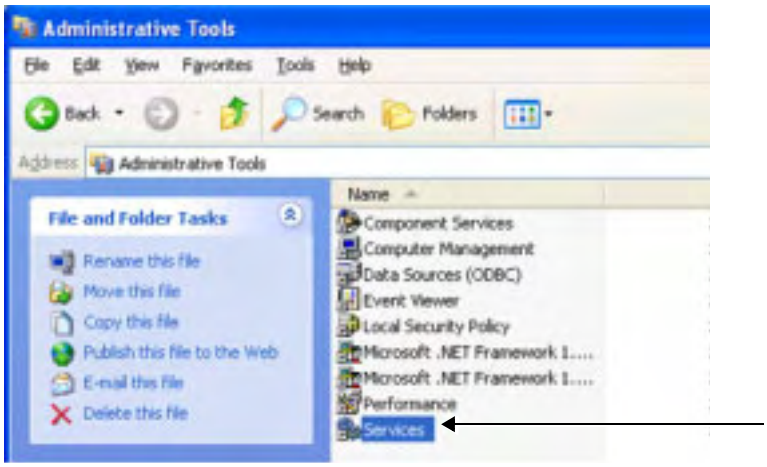


Figure 3-127 Administrative Tools Dialog Box

3.) Double-click on **Services**.

4.) From the Services dialog box, select your **firewall program** (for example, Black Ice).

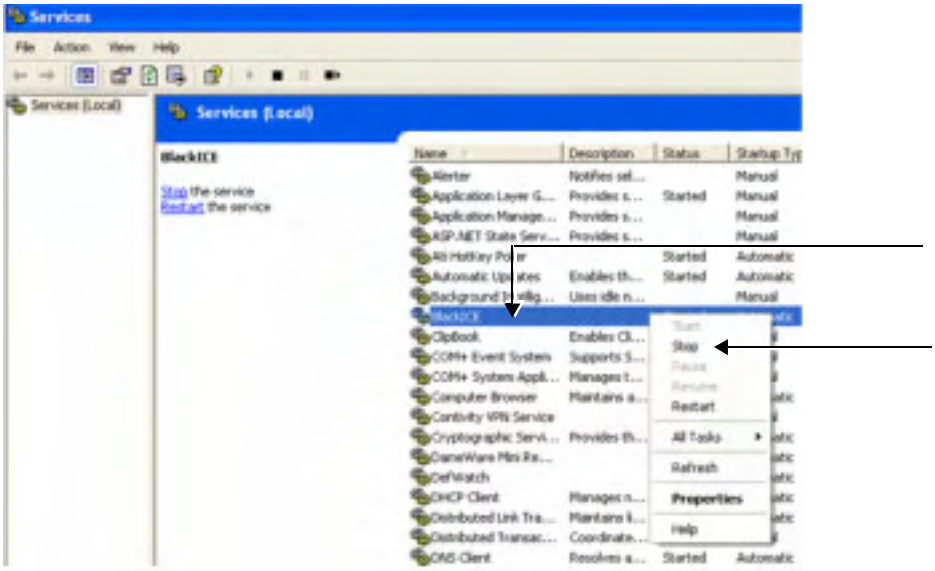
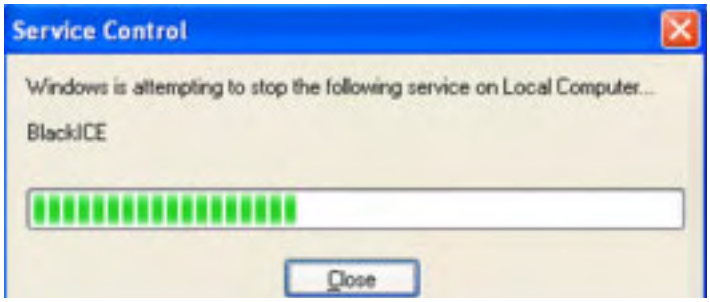


Figure 3-128 Services Dialog Box

5.) Right -click and select **Stop** from drop-down menu.

The following message will be displayed indicating that the Firewall is being stopped.



6.) When finished, click **Close**.

7.) Now you can try to reconnect the network computer to the Vivid-i™ system.

Stopping the Firewall on Windows XP Service Pack 2

1.) On the network computer, access the **Control Panel**, as follows:

a.) Press **Start**.

b.) Select **Settings**

c.) Select **Control Panel** from the Menu

2.) Double-click on **Windows Firewall.**

The Windows Firewall dialog box opens:

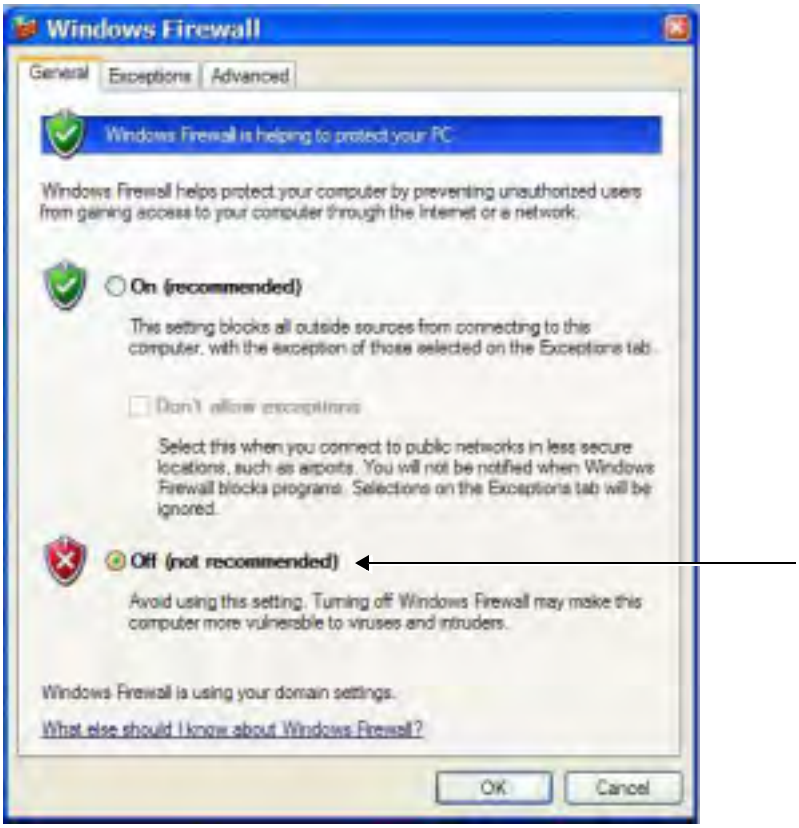

Windows Firewall
General
Exceptions
Advanced
Windows Firewall is helping to protect your PC
Windows Firewall helps protect your computer by preventing unauthorized users from gaining access to your computer through the Internet or a network.
On (recommended)
This setting blocks all outside sources from connecting to this computer, with the exception of those selected on the Exceptions tab.
Don't allow exceptions
Select this when you connect to public networks in less secure locations, such as airports. You will not be notified when Windows Firewall blocks programs. Selections on the Exceptions tab will be ignored.
Off (not recommended)
Avoid using this setting. Turning off Windows Firewall may make this computer more vulnerable to viruses and intruders.
Windows Firewall is using your domain settings.
What else should I know about Windows Firewall?
OK
Cancel

Figure 3-129 Windows Firewall Dialog Box

3.) Select the **General** Tab.

4.) Enable the **Off** check box (as shown in Figure 3-129).

5.) Press **OK**.

6.) Close all windows to return to the scanning screen.

3-8-9-2 Un-installing MPEGVue on a Remote PC

1.) Log in to Windows with **Administrator** permissions.

Note: You may need to obtain these from the local IT person.

2.) Close all Internet Explorer windows, if open.

3.) From the **C:\Program Files\GEULS\eStorePlayer\Version1_0** folder, double-click on the **UnRegisterAll.bat** icon, as shown in Figure 3-130 below.

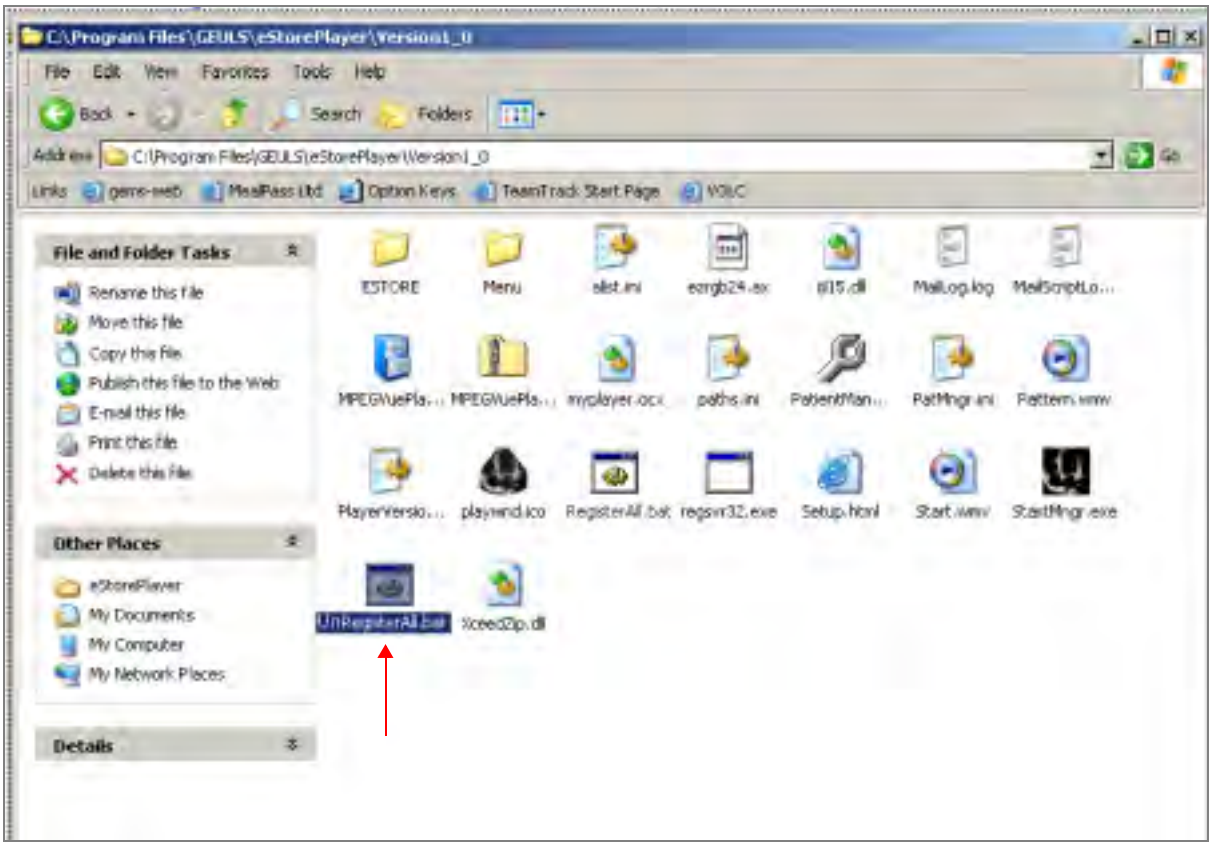


Figure 3-130 Uninstall MPEGvue - Stage 1

4.) If two messages are displayed one after another (shown in Figure 3-131 and Figure 3-132), click the **OK** button on each of them to close the message.

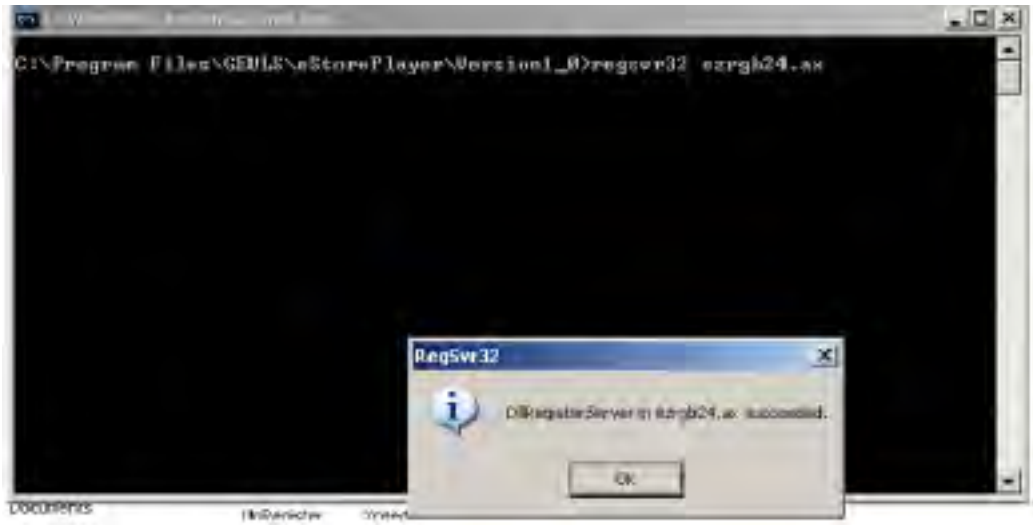


Figure 3-131 Uninstall Message 1

Figure 3-132 Uninstall Message 2

d.) From the **C:\Program Files\GEULS\eStorePlayer\Version1_0\ folder**, delete all files, as shown in Figure 3-133 on page 3-131.

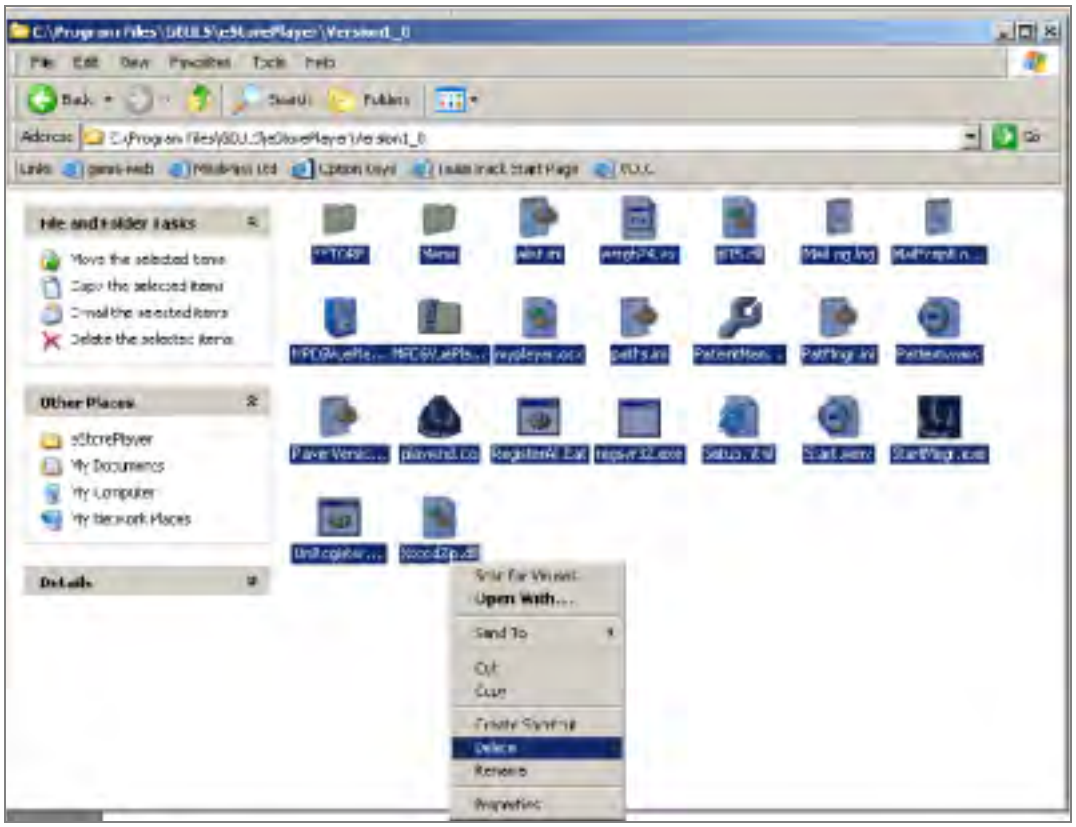


Figure 3-133 Deleting All Files

5.) Restart Windows, then confirm that the MPEGVue application is no longer installed.

3-8-9-3 Using MPEGVue Viewer on a Remote PC

3-8-9-3-1 Reading an MPEGVue Exam

An MPEG exam can be read on any computer with Windows 2000/XP/2003, provided that DirectX 8.1 (or later) and Windows Media Player 7.1 (or later) are installed.

NOTE: DirectX 9 and Windows Media Player 9 are recommended.

In addition, the following requirements should be met:

- CPU speed: 900 MHz or faster
- RAM Memory: 128 MB or higher
- Screen resolution: 1024 x 768 pixels (recommended)
- Colors: 24 bit or higher
- The PC should be configured for Auto-play.

To read an MPEGVue exam stored on a CD, proceed as follows:

- Insert the MPEGVue CD in the computer CD drive.

  The *MPEGVue Patient List* is displayed (see Figure 3-134 below).

Note: In the event that the MPEGvue CD is being run for the first time, the program will self-install the MPEGvue viewer. For more details, refer to Installing MPEGVue on a Remote PC on page 3 - 116.

To read MPEGVue exams stored on other media:

1) Insert the media (MOD or Memory stick) containing the MPEGVue exams into the MOD drive (or USB port) on the remote computer.
2) Double-click on the file **START_MPEGVue.bat**.

   The *MPEGVue Patient List* is displayed (see Figure 3-134 below).

3-8-9-3-2 MPEGVue Patient List

The MPEGvue player will always start by showing the Patient List contained in the inserted media (see the example below).

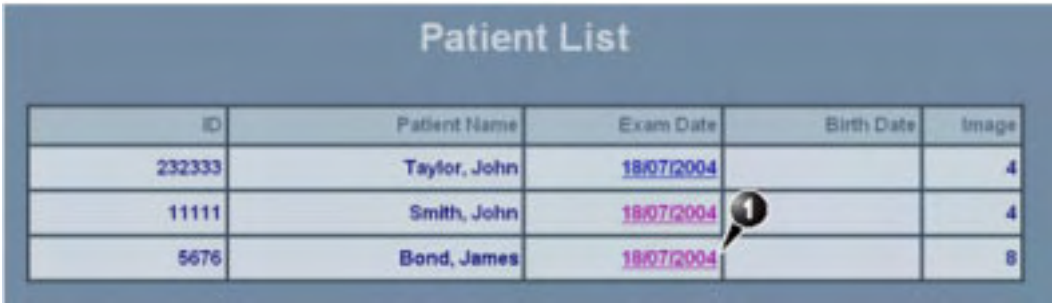


Figure 3-134 MPEGVue Patient List

1) Click on the required examination **Exam Date** (labelled 1 in the example above) to select and display images of that exam.

The *MPEGVue screen* is displayed as shown in the example in Figure 3-135 below.

1.	Clipboard: select the image to display	8.	Save image as MPEG or Bitmap file
2.	Selected image	9.	Measurement tool
3.	Single frame image	10.	E-mail support
4.	Cineloop	11.	Display previous/next image
5.	Freeze/run cineloop	12.	Display reports (button appears only when report is available)
6.	Scrolling tool when in Freeze	13.	Display the MPEGVue Patient List
7.	Full Screen (press any key to return to normal view)	14.	Quit MPEGVue Screen

Figure 3-135 MPEGVue Screen

2) Proceed to use the navigation tools described below to select an image and perform the various review functions, as required.

3-8-9-3-3 Selecting an Image

When a thumbnail image is selected for review, the thumbnail image in the clipboard area becomes bounded (highlighted) with a yellow frame. This currently-selected image is also displayed in full size in the MPEGVue Screen view pane.

There are several ways to select a thumbnail image from the clipboard:

- Use the mouse pointer. With the pointer on the required image, click the *left* mouse button to select the image.
- Use the **up** or **down** keyboard arrow to view the *next* or *previous* loop in the exam.
- Click on the **Next Image** or **Previous Image** buttons (#11 in Figure 3-135), as required.

3-8-9-3-4 Stopping & Running the Cine-Loop

When a loop is selected, it appears on the screen in *Run-Mode*.

There are several ways to stop a loop and view it frame-by-frame:

- Clicking on the **Freeze/Run** icon (#5 in Figure 3-135) will *freeze* the loop. Clicking on same icon once again will run the loop again.
- Clicking on the **scrolling** icons (#6 in Figure 3-135) will *stop* the loop, allowing the user to advance *forwards* or *backwards* to the required frame.
- Using the **left / right** arrows - when the loop is in *Run-Mode*, pressing either the **left** or **right** arrows on the PC keyboard will *freeze* the loop. Further pressing the left or right arrows will *advance* the loop frame-by-frame.

3-8-9-3-5 Selecting a Different Patient

Click on the **Back to Patient List** button (#13 in Figure 3-135). On the Patient List, click on the **Exam Date** of the required patient.

3-8-9-3-6 Exporting Images or Loops from MPEGvue

Using the “Save As…” function, an image may be saved to any of the following file formats:

- .BMP
- .WMV (MPEG4)
- .JPEG

To save an image, click on the diskette icon (#8 in Figure 3-135). A *Save As…* dialog-box will appear, allowing you to select the desired file format in which to save the image.

3-8-9-3-7 Performing Measurements on MPEGVue Images

The following measurements can be performed on MPEGVue images:

- Distance and area in 2D images
- Height, time, and slope in M-mode images
- Velocity and time in Doppler modes

In a 2D image:

1) Select the **Measurement** tool (#9 in Figure 3-135).

   The distance measurement tool is automatically selected.

2) Perform the distance measurement.

3) To perform an area measurement, right-click on the image and select **Area**. Perform the area measurement.

In Other Modes:

1) Select the **Measurement** tool (#9 in Figure 3-135).

2) Perform the measurement.

Note: If the original image contains measurements that were taken and stored on the Vivid-i™ scanner, those measurements will appear in the MPEGvue image. In this case, additional measurements cannot be performed on that image.

Note: Currently, the measurement function is not available on DICOM images/loops, any secondary captured screens 3D images, or images with discontinuities.

3-8-9-3-8 Saved Worksheets

On the Vivid-i™ scanner, it is possible to view the Worksheet and press **Store**. This will generate a still frame showing a snapshot of the Worksheet with the visible measurements on it. This same snapshot will also be visible in the MPEGvue Viewer.

This feature allows users to archive some important measurements into the MPEGvue file.

3-8-9-3-9 Reports (.CHM files)

When Reports have been generated and saved on the Vivid-i™ scanner, they will be exported, along with the rest of the MPEGvue exam to the remote PC where they can be reviewed as CHM files.

When an exam contains Reports, an additional button is displayed on the bottom of the MPEGvue Screen enabling the user to view the Reports of that exam.

3-8-9-3-10 Using MPEGVue over E-mail

Note: To use the MPEGVue over E-mail feature, Microsoft Outlook must be currently running. If not, the following message is displayed prompting the user to first logon to Outlook:

It is possible to send images, loops, or full exams from any eVue PC. An eVue PC is a PC which contains the MPEGvue player and an e-mail client application (e.g. Microsoft Outlook).

The currently-selected image, or the entire examination, can be sent by e-mail as an attachment to one or several regular e-mail messages. Refer to Sending a Full Examination by E-mail below, or Sending an image by E-mail on page 3 - 137, as applicable.
The recipient PC of those e-mail messages (where the eVue viewer is installed), will receive the exams and will integrate them into its Patient List, for easy review.

Sending a Full Examination by E-mail

Note: If this is the *first* time your recipient is receiving MPEGVue images, it is necessary to attach the MPEGVue Player - refer to the instructions for Sending the MPEGVue Player Software by E-mail on page 3 - 139.

1) From the MPEGVue Screen, open the examination to be sent and click the **E-mail** button (#10 in Figure 3-135 on page 3-133).

   The *E-mail Dialog* box is displayed (see Figure 3-136 on page 3-136).

2) Activate the **Send Current Exam** radio button (and if necessary, the **Attach Player Software** check box), as shown in Figure 3-136 below.

Figure 3-136 E-mail Dialog Box - Sending Current Exam

3.) Click **Next**.

The *E-mail address window* is displayed (Figure 3-137 below).

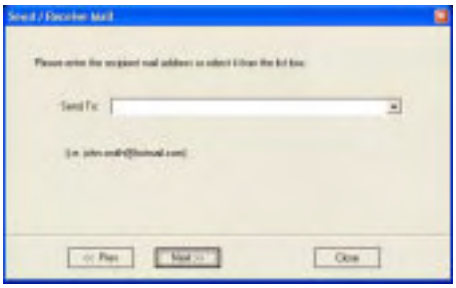


Figure 3-137 E-mail Address Window

4) Select an existing recipient address from the drop-down menu, or type a new address in the **Send To** field.

Note: Up to 10 addresses can be stored for future selection.

5) Click **Next**.

The user is prompted to enter a password (for encryption of the study) in the window displayed:

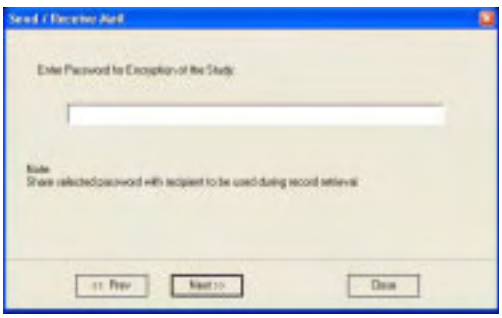


Figure 3-138 Enter Password Window

6) Type a unique password for the study.

Note: ***The password should be given to the recipient of the e-mail verbally by phone or by other protected means.***
(It is recommended to keep a separate record of passwords used).

7) Click **Next**.

The E-mail (addressed to the selected addressee) with the full examination attached is sent to the Outbox; during this operation a series of progress windows are displayed, as seen in this example:

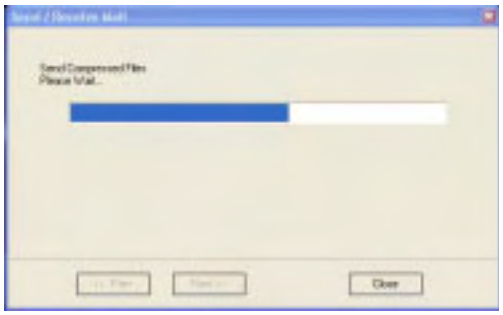


Figure 3-139 Sending Message to Outbox Progress Window

When the operation is complete, a *Confirmation window* is displayed as shown below.

Operation Completed
Send operation completed successfully!
Please ensure delivery of Emails placed in the Outbox of your Outlook.
OK

Figure 3-140 Operation Completed Message

8) Click **OK** to close the message window.

9) Check that the e-mail message has been sent from the Outlook Outbox.

Notes: Examinations sent by E-mail as attachments are compressed, encrypted, and password-protected. If the size of the exam is too large to be sent as a single attachment, it is divided into several zip file attachments sent with several independent E-mails, each less than 1Mbyte in size.

The extension of the attached files is **.mpegvue** and can only be opened with the MPEGvue viewer.

Sending an image by E-mail

Note: If this is the *first* time your recipient is receiving an MPEGVue image, it is necessary to attach the MPEGVue Player - refer to the instructions for Sending the MPEGVue Player Software by E-mail on page 3 - 139.

1) From the clipboard, select the image to be sent and click the **E-mail** button (#10 in Figure 3-135 on page 3-133).

The *E-mail Dialog* box is displayed.

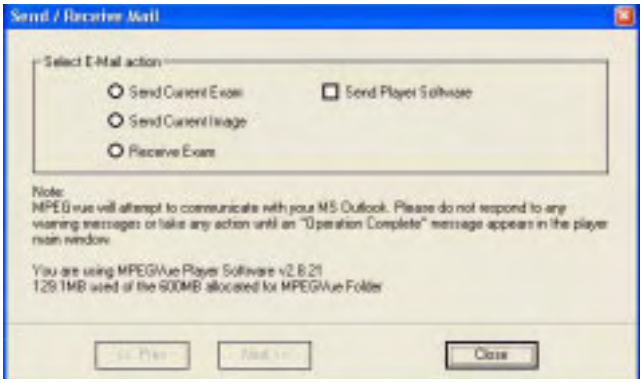


Figure 3-141 E-mail Dialog Box

2) Activate the **Send Current Image** radio button, then click **Next**.

Note: If it is necessary to send the MPEGVue Player software to the recipient, first complete this procedure, then proceed to Sending the MPEGVue Player Software by E-mail on page 3 - 139.

The *E-mail address window* is displayed.

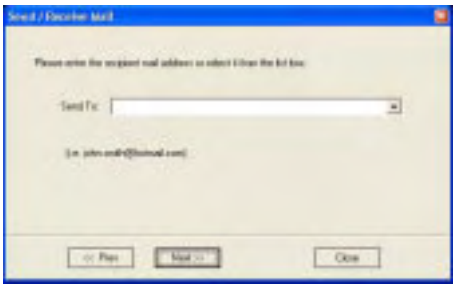


Figure 3-142 E-mail Address Window

3) Select an existing recipient address from the drop-down menu, or type a new address in the **Send To** field.

Note: Up to 10 addresses can be stored for future selection.

4) Click **Next**.

The E-mail (addressed to the selected addressee) with the image is sent to the Outbox; during this operation a progress window is displayed:

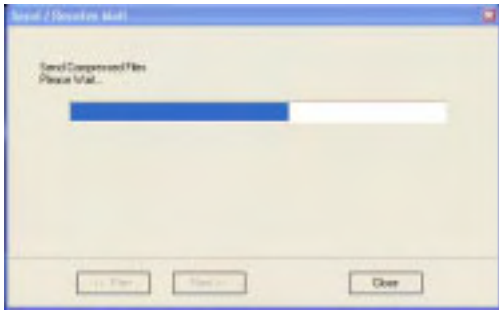


Figure 3-143 Sending Message to Outbox Progress Window

When the operation is complete, a *Confirmation window* is displayed as shown below..

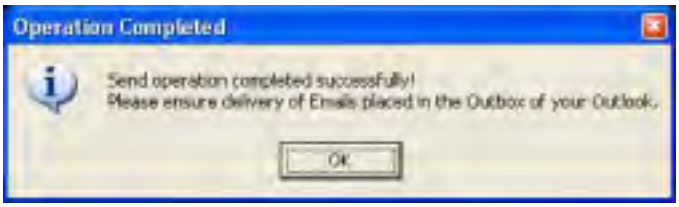

Operation Completed
Send operation completed successfully!
Please ensure delivery of Emails placed in the Outbox of your Outlook.
OK

Figure 3-144 Operation Completed Message

5) Click **OK** to close the message window.

6) Check that the message has been sent from the Outlook Outbox.

When the message has been sent from the Outbox and received by the E-mail recipient, the image can now be opened in Windows Media Player.

Sending the MPEGVue Player Software by E-mail

Note: This procedure is required *once* - only the *first* time your recipient is receiving MPEGVue image/s.

1) From the *E-mail Dialog* box, activate the Send Player Software check box:

Figure 3-145 E-mail Dialog Box - Sending Player Software

2) Click **Next**.

3.) From the Email Address Window (Figure 3-142 on page 3-138), select the appropriate recipient address from the drop-down menu, or type the address in the **Send To** field.

4) Click **Next**.

The E-mail (addressed to the selected addressee) with the MPEGVue Player software is sent to the Outbox; during this operation a progress window is displayed (Figure 3-139).

When the operation is complete, a Confirmation window is displayed as shown in Figure 3-140.

5) Click **OK** to close the message window.

6) Check that the message has been sent from the Outlook Outbox.

Note: When the message has been sent from the Outbox and has arrived at the addressee, the recipient should follow the instructions (included in the body of the email) in order to install the MPEGVue Player.

First Time Receipt of MPEGVue Player Software and Images by E-mail

When a group of messages arrive by e-mail and the user wishes to review the exam by MPEGvue, proceed as follows:

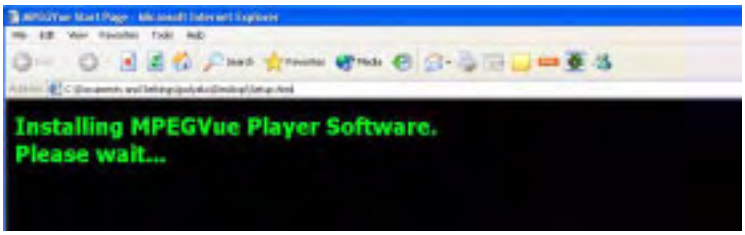
1) From Outlook, open the received email message containing the *installation of MPEGVue Player* files (three attachments: MPEGVuePlayer.cab; Start.wmv; Setup.html). Right-click on each attachment and select *Save As* to save them to the **Desktop**.

Note: Do not double-click on an attachment.

2) From the desktop, double-click on the

icon.

The *following message* is displayed:



3) When prompted by the Warning message shown below, make sure all Internet Explorer windows are closed except the current window, then click **Yes** to proceed..

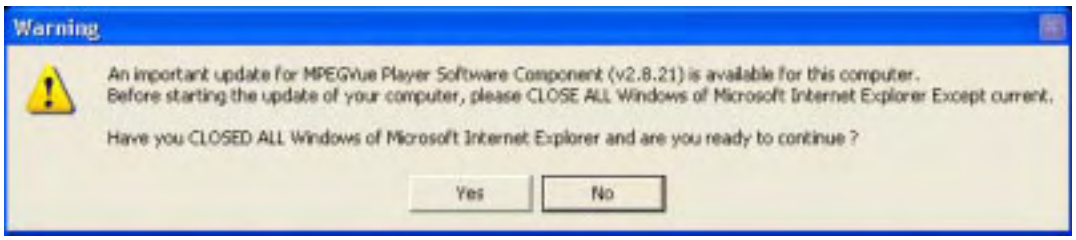

Warning
An important update for MPEGVue Player Software Component (v2.8.21) is available for this computer.
Before starting the update of your computer, please CLOSE ALL Windows of Microsoft Internet Explorer Except current.
Have you CLOSED ALL Windows of Microsoft Internet Explorer and are you ready to continue ?
Yes
No

Figure 3-146 Warning Message

When the installation of the MPEGVuePlayer software is complete, the MPEGVue Player Screen is displayed as shown in Figure 3-148 on page 3-142.

Note: At this point, the MPEGVue startup icon is now displayed on the desktop, ready for future use. The user may choose to view the images immediately or later (as preferred). Follow the instructions described in Get new exams by E-mail on page 3 - 142.

3-8-9-3-11 Managing and Viewing Exams Received

Once the MPEGVue Player software has been installed on a remote computer (as described in First Time Receipt of MPEGVue Player Software and Images by E-mail on page 3 - 140), the user is able to manage and review images or exams received via email, EXPORT OR REMOVABLE MEDIA?, using the MPEGVue utilities described below.

1) From the desktop, double-click on the MPEGVue Startup icon.

The MPEGVue Startup Menu opens:

1.	Provides access to Outlook Inbox
2.	Opens Patient List (lists only studies received by email)[a]
3.	Activates e-Vue - opens Patient List of studies received via export operation[a]
4.	Enables user to manage patient exams received by email, export or removable media (using copy, move or delete, as applicable)

a. button is disabled until images or exams have been received

Figure 3-147 MPEGVue Startup Menu

2) Proceed to use the required utility, as described in the procedures below.

3-8-9-3-12 Get new exams by E-mail

1) From the MPEGVue Startup Menu, click on the **Get new exams by email** button.

   The Start MPEGVue screen is displayed, as shown in Figure 3-148 below.

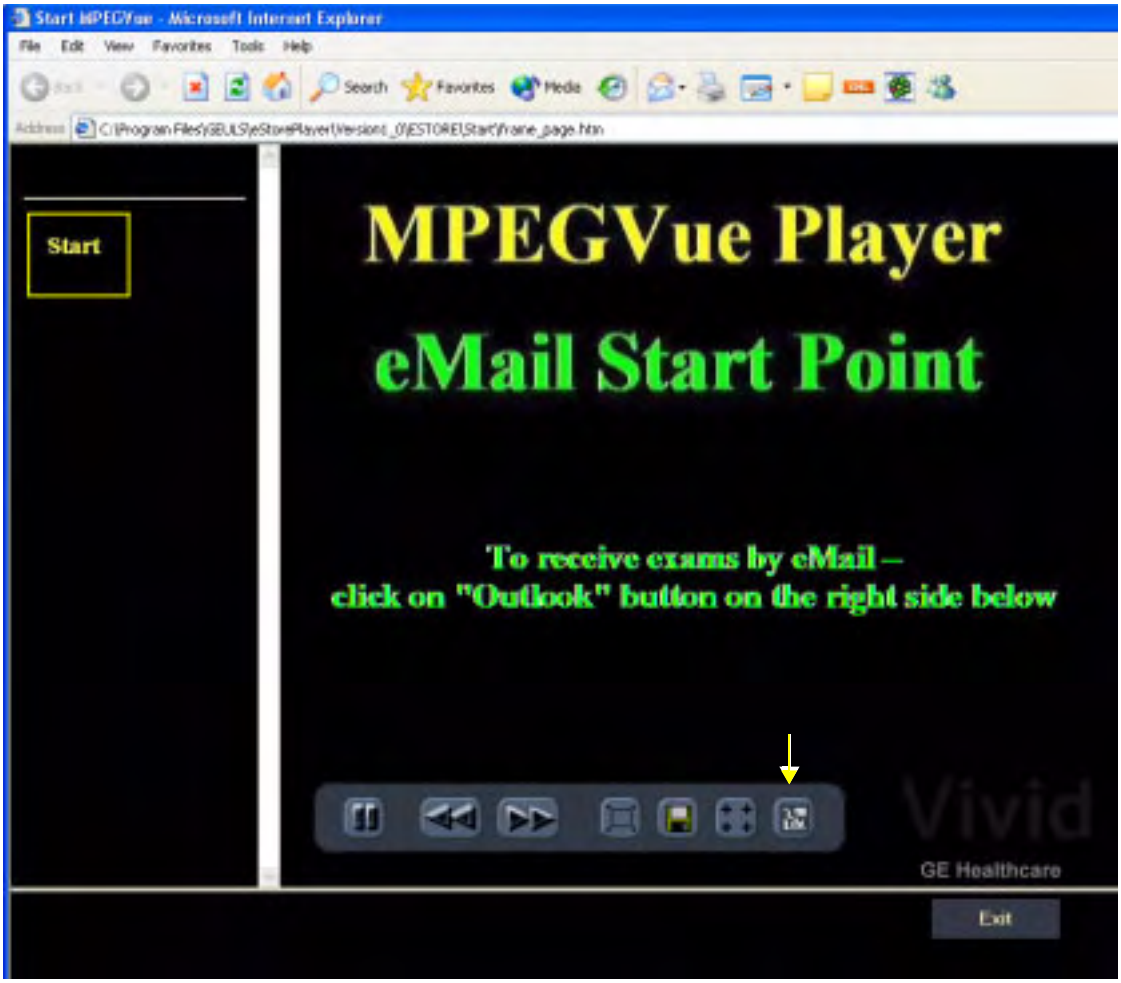


Figure 3-148 Start MPEGVue Screen

2) Click the Outlook **E-mail** button (shown in Figure 3-148).

   The E-mail dialog box is displayed - refer to Figure 3-141 on page 3-138.

3.) Activate the **Receive Exam** radio button, then click **Next**.

The following message is displayed while the e-mail Inbox is being scanned for studies:

When complete, all studies found in the Inbox are listed in the Found Studies dialog box, as shown in Figure 3-149 below.

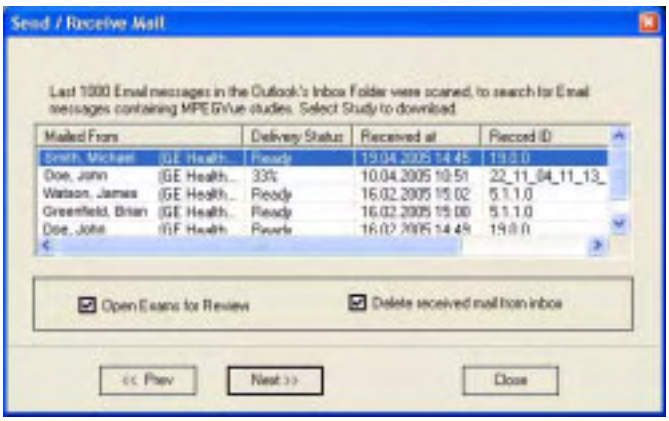

Send / Receive Mail
Last 1000 Email messages in the Outlook's Inbox Folder were scaned, to search for Email messages containing MPEGVue studies. Select Study to download
Mailed From
Delivery Status
Received at
Placed ID
Open Exams for Review
Delete received mail from inbox
<< Prev
Next >>
Close

Figure 3-149 List of Studies Found in Inbox

4) Select the required Study from the list.

Note: By default, the **Open Exams for Review** and **Delete Received Mail from Inbox** check boxes are activated.

5.) Click **Next**.

The *Password window* is displayed:.

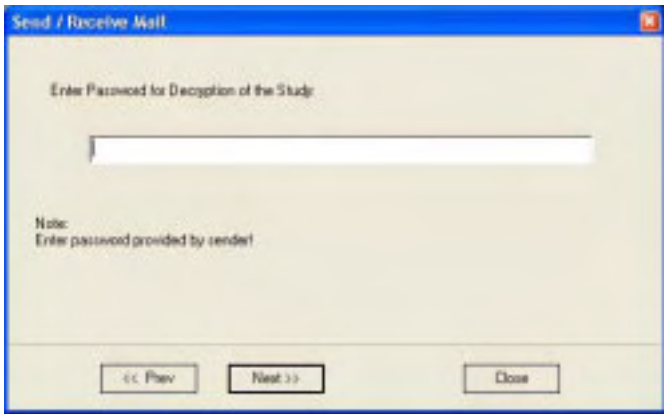
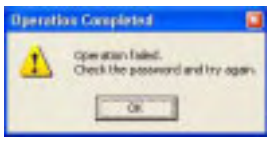


Figure 3-150 Password Window

6) Enter the same password (for decryption of the study) as that used by the sender of the e-mails.

Note: The Password is case-sensitive. In the event that an incorrect password is typed, the user is prompted with a warning message, as shown here. Click **OK** and enter the correct password.



7) Click **Next**.

The message *Receiving Selected Messages* is displayed, followed by another message (see Figure 3-151 below) showing progress of deletion of messages from the Inbox.

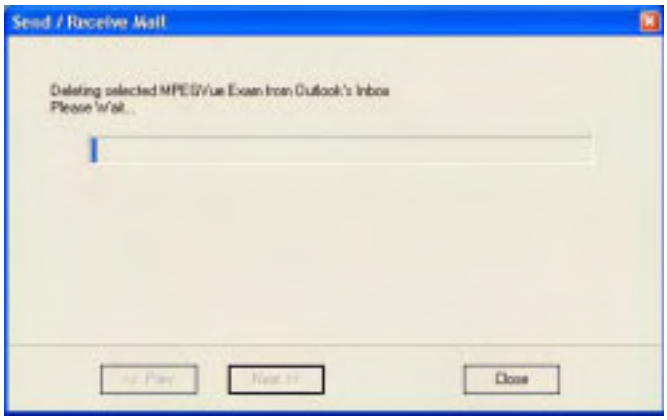


Figure 3-151 Message Showing Exams being Deleted from Inbox

The E-mail message(s) containing the MPEG examination is deleted from “In-box” of Outlook and is moved to the “Deleted-items” box of Outlook. When done, the following message is displayed:

8) Click **OK** to close the message.

The exam is now listed in the MPEGVue Patient List (see Figure 3-152 below) and is ready for selection and viewing.

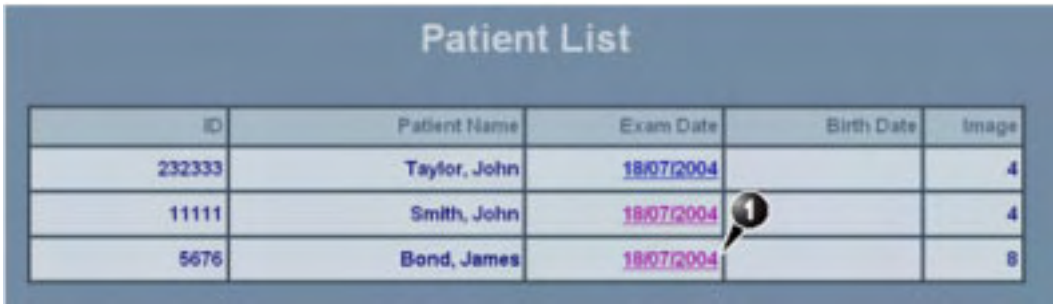


Figure 3-152 MPEGVue Patient List

Note: When viewing the examination which has been received from e-mail, a separate instance of MPEGvue application is opened, dedicated only for one e-mail examination. If you were previously viewing different MPEGvue Patient exams, you will need to switch over to the previous instance of the MPEGvue.

Receiving and Viewing a Partial Examination

In the event that the exam is large and a group of e-mails is expected, it is possible to view a partial exam, even before all of the e-mail messages have arrived.

In addition, if an e-mail message is lost or corrupted, the contents of the remainder of the received messages is available for review.

After receiving even one e-mail message out of many that have yet to arrive, simply select the new examination in the MPEGVue Screen. The screen display will show voids or missing thumbnail images in all places relating to the e-mail messages that have not yet arrived.

View previous exams from E-mail

1) From the MPEGVue Startup Menu, click on the **View previous exams from email** button.

   The Patient List is displayed, listing all exams received by email:

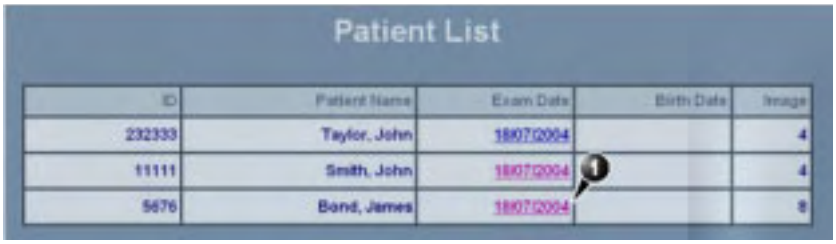


Figure 3-153 MPEGVue Patient List

2) Click on the required examination **Exam Date** (labelled 1 in the example above) to select and display images of that exam.

   The *MPEGVue screen* is displayed as shown in the example in Figure 3-135 on page 3-133.

Activate e-Vue

1) From the MPEGVue Startup Menu, click on the **Activate e-Vue** button.

   The Patient List is displayed, listing all e-Vue exams received (refer to Figure 3-153, above).

2) Click on the required examination **Exam Date** (labelled 1 in the example above) to select and display images of that exam.

   The *MPEGVue screen* is displayed as shown in the example in Figure 3-135 on page 3-133.

Using Patient Manager

1) From the MPEGVue Startup Menu, click the Patient manager button.

The MPEGVue Patient Manager window opens, as shown below:

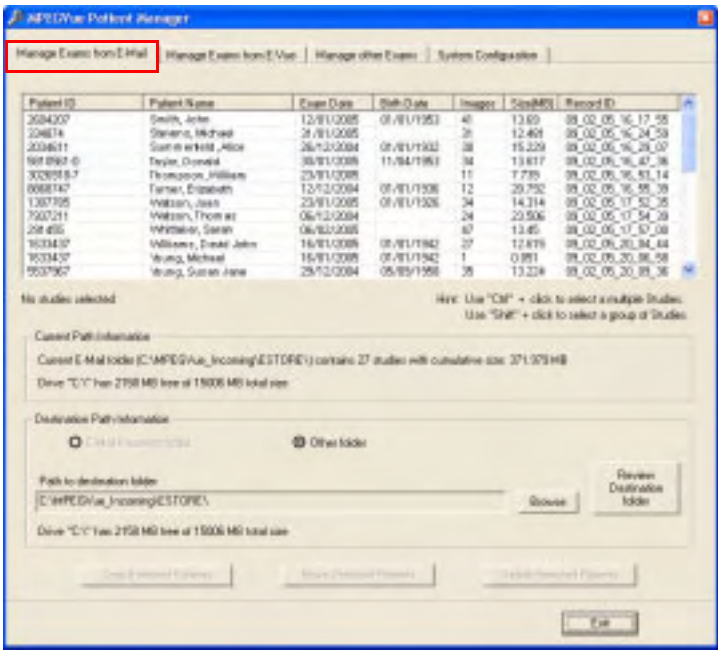


Figure 3-154 MPEGVue Patient Manager Window - Manage Exams from Email Tab

The MPEGVue Patient Manager window has four tabs that provide access to the following utilities:

- Manage Exams from Email
- Manage Exams from e-Vue
- Manage Other Exams
- System Configuration

Note: By default, when the MPEGVue Patient Manager window is first opened, the Manage Exams from Email tab is activated.

2.) **Manage Exams from Email**, as follows:

a.) Make sure the Manage Exams from Email tab is activated as shown in Figure 3-154.

The Patient List displays details - in table format - of all patient exams received by email (*Patient ID*, *Patient Name*, *Exam Date*, *etc*.).

The current path information is displayed below the Patient List as well as number of studies, cumulative size and amount of space available on the drive. By default, the destination path *Other Folder* radio button is enabled.

b.) Select the required exam or exams, as shown in Figure 3-155.

(Use Ctrl +click to select more than one study; Shift + click to select a group of studies)

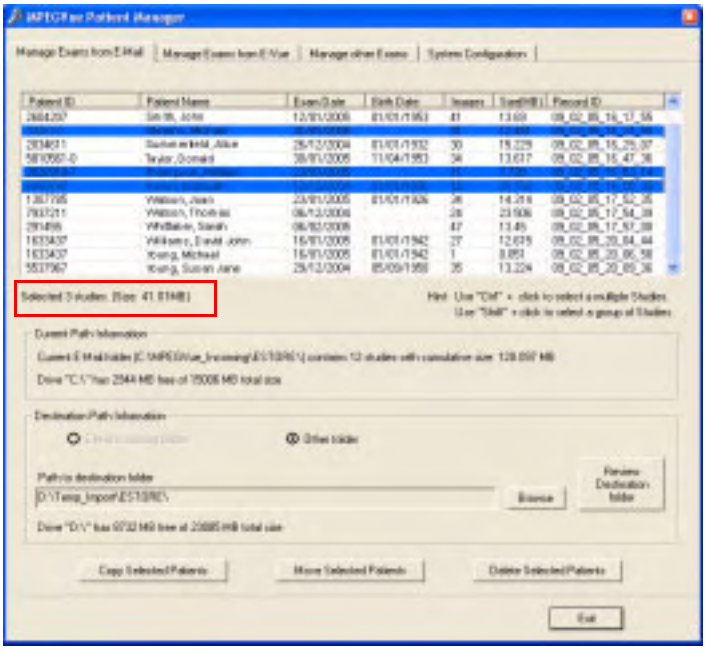


Figure 3-155 Exams Selected

The currently-selected exams are now highlighted in the list and, as shown in Figure 3-155, the cumulative size of the 3 studies is displayed below.

The three study management buttons are now as follows:

Delete Selected Patients - enabled

Copy Selected Patients and *Move Selected Patients* - remain disabled until at least one Study has been selected and the Destination Path has been specified (providing the destination is NOT read-only media [such as, CD/DVD-ROM]). Only when *both* these tasks have been performed will these two buttons become enabled.

c.) To **copy** or **move** the selected exams, first click the Browse button and select the required destination folder, then click the **Copy Selected Patients** *or* **Move Selected Patients** button as appropriate.

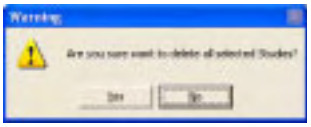
(If necessary, click the Review Destination folder button to review the destination folder Patient List).

During the copy or move operation, the relevant message and progress bar is displayed:

Note: When the selected studies have been *copied* to the destination folder, they will remain listed in the MPEGVue Patient Manager Patient List. However, if they have been *moved*, they will no longer be listed.

d.) To **delete** the selected exams, click the **Delete Selected Patients** button.

The user is prompted with the following warning message.



Click **Yes** to confirm the delete command.

Note: When the selected studies have been *deleted*, they will no longer be listed in the MPEGVue Patient Manager Patient List.

3.) **Manage Exams from E-vue**, as follows:

a.) Make sure the Manage Exams from Evue tab is activated as shown in Figure 3-156.

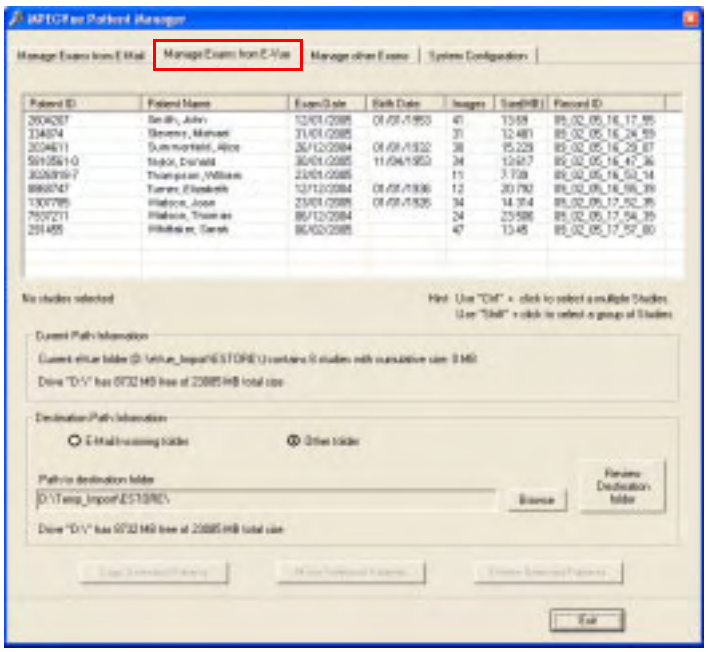


Figure 3-156 MPEGVue Patient Manager Window - Manage Exams from E-VueTab

The Patient List displays details - in table format - of all patient exams received via export from E-Vue (*Patient ID*, *Patient Name*, *Exam Date*, *etc*.).

The current path information is displayed below the Patient List as well as number of studies, cumulative size and amount of space available on the drive. By default, the destination path *Other Folder* radio button is enabled.

b.) Select the required exam or exams - refer to step b on page 3-147.

c.) **Copy** or **move** the selected exam/s, as required - refer to step c on page 3-148.

d.) If required, **delete** the selected exam/s - refer to step d on page 3-148.

4.) **Manage Other Exams**, as follows:

a.) Make sure the Manage Other Exams tab is activated as shown in Figure 3-157.

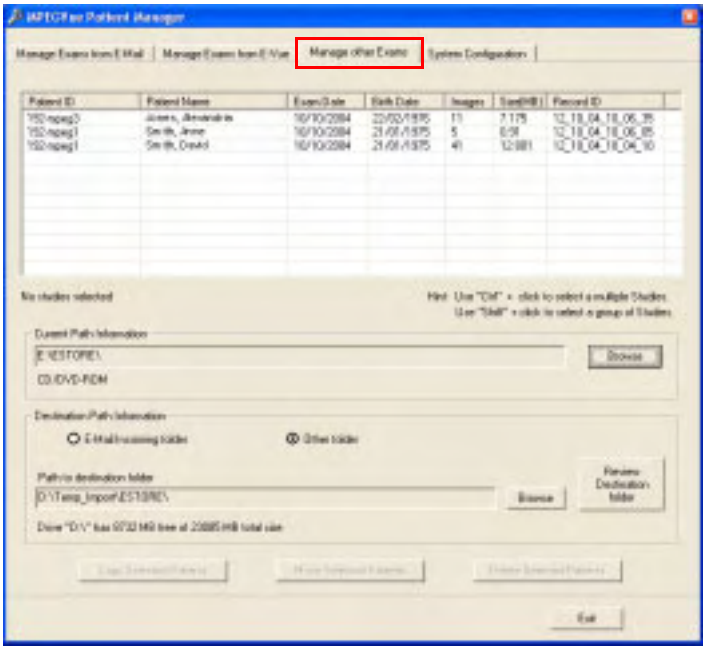


Figure 3-157 MPEGVue Patient Manager Window - Manage Other Exams Tab

Note: When the Manage Other Exams tab is first activated, the MPEGVue Patient Manager Window opens (by default) with the most recently-selected source directory active (even if the user selected this directory during *Copy*, *Move*, or *Delete* operations performed under another tab). At this stage, no information will be displayed in the Patient List.

Once the user has specified any source directory that contains MPEGVue studies (these may be located on CD/DVD-ROM, DOK or any local hard drive), exam details are displayed (in table format) in the Patient List. The information shown includes *Patient ID*, *Patient Name*, *Exam Date*, *etc*. as seen in the example in Figure 3-157, above.

The current path information is displayed below the Patient List together with details of the removable media (e.g., CD/DVD-ROM). By default, the destination path *Other Folder* radio button is enabled; additional information below shows the Path to destination folder.

b.) Select the appropriate **Current Path Information** - if necessary, click the adjacent **Browse** button and select the correct source directory.

All patient exams found in the currently-selected source directory are listed in the Patient List.

c.) Select the appropriate **Path to Destination Folder** - if necessary, click the adjacent **Browse** button and select the required directory.

d.) From the Patient List, select the required exam/s to be copied.

If the currently-selected source directory is CD/DVD-ROM (read-only media), the *Copy Selected Patients* button is now enabled, as shown in Figure 3-158 below.

Note: If the currently-selected source directory is DOK or the local hard drive, the *Delete Selected Patients* and the *Move Selected Patients* buttons are also now enabled.

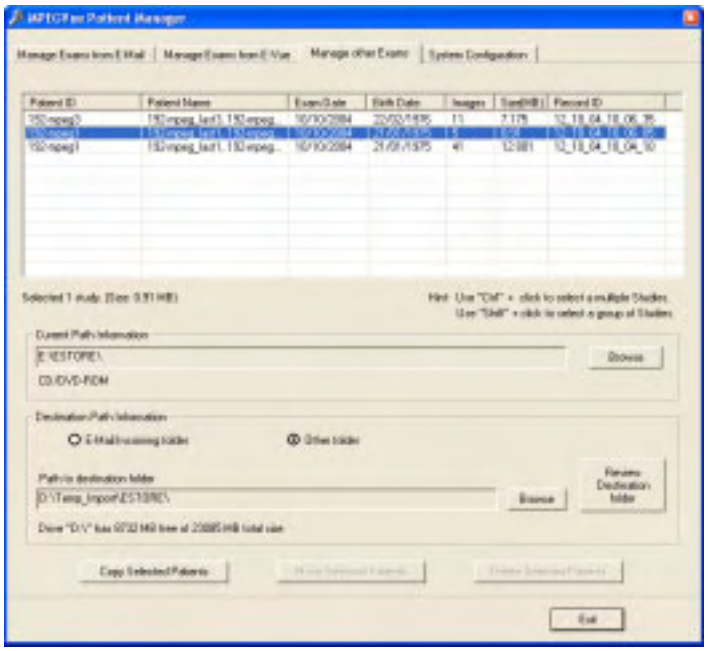


Figure 3-158 Exams Selected for Copying

e.) Click the **Copy Selected Patients** button.

During the copy operation, the following message and progress bar is displayed:

When done, the currently-selected exam/s are available in the destination folder for review.

5.) If required, access the **System Configuration** utility, as follows:

a.) Make sure the System Configuration tab is activated as shown in Figure 3-159.

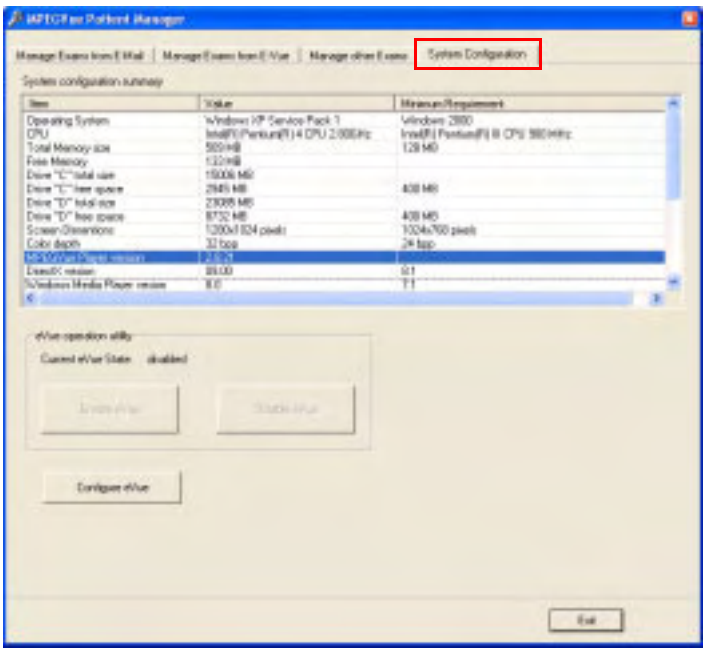


Figure 3-159 MPEGVue Patient Manager Window - System Configuration Tab

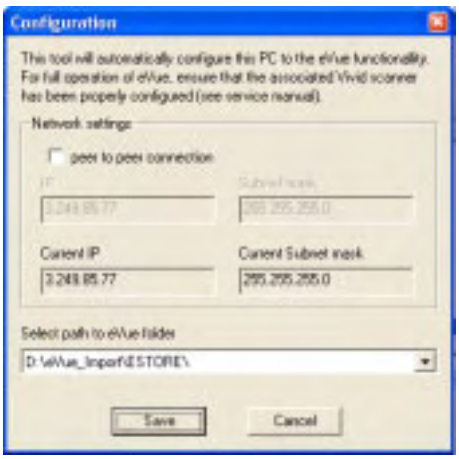
System Configuration read-only information is displayed (in table format) under the following column headings: *Item*, *Value*, *Minimum Requirements.*

Below this information, the **eVue Operation Utility** buttons enable the user to *enable* or *disable* the eVue mode, as required. An additional button (**Configure eVue**) is used to perform the eVue configuration procedure. THIS PROCEDURE FOR AUTHORIZED USERS ONLY?

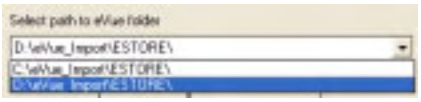
Note: In order to enable eVue operation, it is necessary to first perform the eVue configuration procedure as described in the following step.

b.) Configure eVue (if required), as follows:

Click the **Configure eVue** button. The Configuration dialog box opens:


Configuration
This tool will automatically configure this PC to the eVue functionality.
For full operation of eVue, ensure that the associated Vivid scanner
has been properly configured (see service manual).
Network settings
peer to peer connection
Current IP
Current Subnet mask
Select path to eVue folder
Save
Cancel

Select the required eVue folder destination drive:



If applicable, enable the **peer-to-peer connection** check box then type the correct current IP address and Subnet mask details:

Click **Save** to save the new configuration.

The Enable eVue button is now active, as shown in Figure 3-160 below.

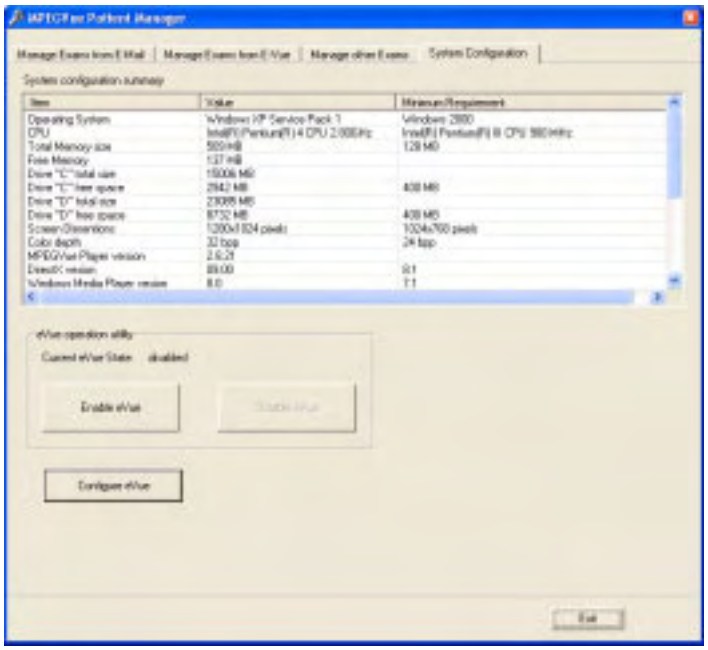


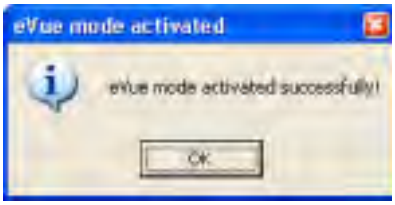
Figure 3-160 System Configuration - Ready to Enable eVue Mode

NOTICE

IMPORTANT To avoid system configuration inconsistencies, before using the **Enable eVue** or **Disable eVue** functions, make sure that your PC is connected to the appropriate network and that all network cables are properly connected. Otherwise, configuration of your PC may become incorrect and the Configuration utility will be unable to execute the *Enable eVue* or *Disable eVue* operations.

In cases of a peer-to-peer connection, before using **Enable eVue** always make sure the two computers (Vivid-i™ scanner and your PC) are properly configured and connected directly.
Before using **Disable eVue**, your PC should be connected back to the local network.

c.) Click the **Enable eVue** button to activate the eVue operation.
The following message is displayed:



Click **OK** to close the message.

Note: The *Disable eVue* button is now active.

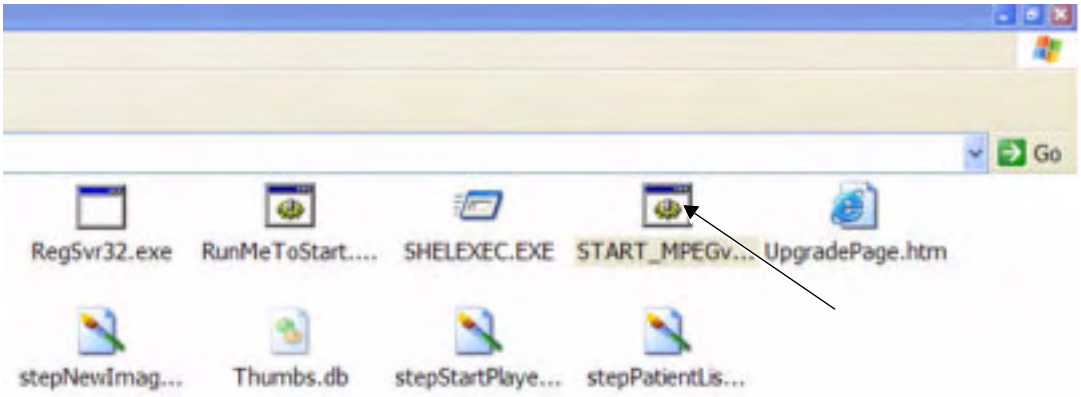
d.) When required, click the **Disable eVue** button to de-activate the eVue operation.
The following message is displayed:

3-8-9-3-13 Using MPEGVue Player

1.) On the remote computer, open the media (CD or Memory Stick) containing the MPEGVue files, or the folder which was set as being shared for import of eVue files.

2.) On the remote computer, open the folder which was set as being shared for import of eVue files.

3.) Double-click on the START_MpegVue Player icon, as shown below:

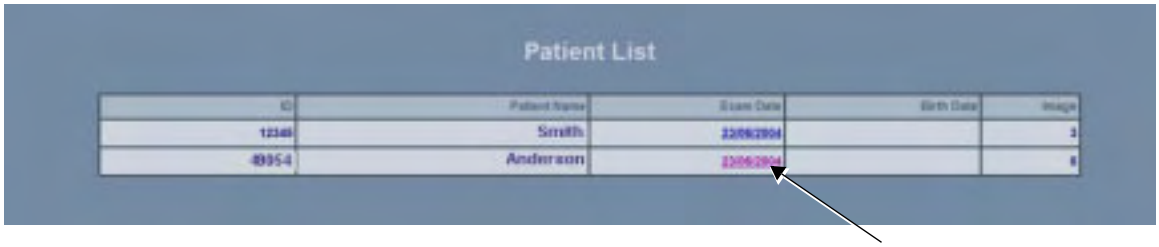


Note: On most computers, when inserting the CD media with MpegVue files, the MpegVue Player will start automatically (due to the autoplay option of CD-ROM).

In the event that any updates are required on the remote computer, the program will prompt the user to install the appropriate components, as necessary. (Follow the on-screen instructions).

When done, the Patient List is displayed.

4.) From the Patient List, double-click on the required examination **Exam Date** (see the example below) to select and display images of that exam.



The Image Review window opens, displaying thumbnail pictures of all the currently-selected patient's images - see Figure 3-161 on page 3-156.

Figure 3-161 Image Review Window

5.) From thumbnails mini-pictures (on the left of the screen), select one for review.

The selected image is displayed in the Image Review window.
As new images are transferred to the remote computer, a message is displayed at the bottom of the image currently being reviewed.

6.) Press <**F5**> to refresh the screen.

Additional thumbnail pictures will be displayed accordingly.

Note: The MpegVue Player can be used as a regular player, using the *Play*, *Stop*, *Forward*, and *Rewind* buttons. In addition, the user can forward images by e-mail, save images, and perform measurements, as previously described.

The MpegVue Player displays two rows of command keys at the bottom of the screen. If the remote computer is set up to view many Tool Bars, the lower row of the MpegVue command keys might not be visible. Therefore, it is recommended to remove most Tool Bars (by selecting <View> <Tool Bars> and un-checking all tools that are not required) until both lines of command keys are visible, as shown below.

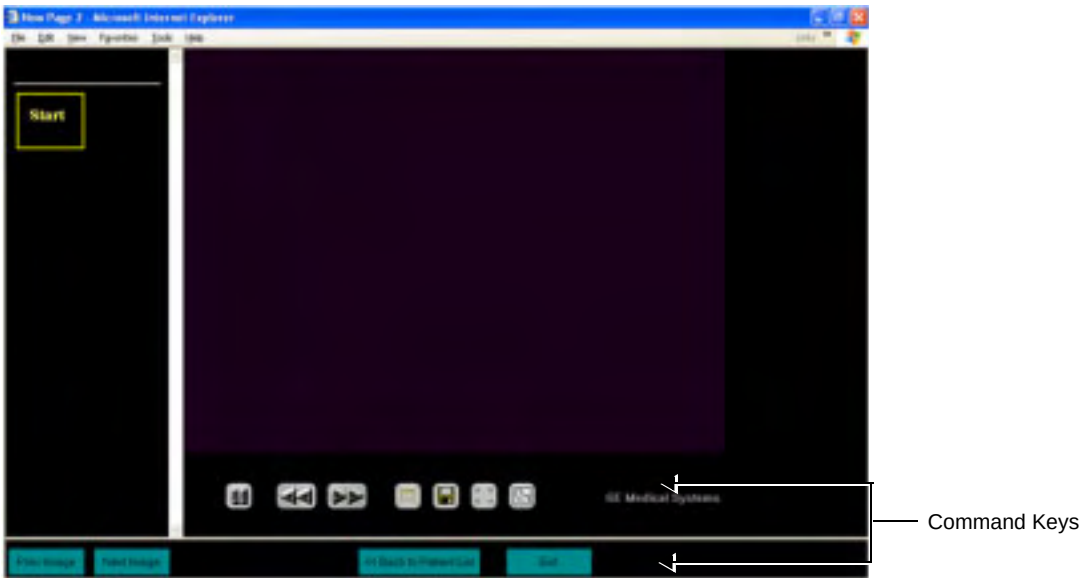


Figure 3-162 MPEGVue Player - Command Keys

Section 3-9
Storing and Transporting the Unit

The Vivid-i™ ultrasound unit mounted on a SafeLock cart weighs up to 45 kg (99 lbs), depending on the configuration. To avoid equipment damage and ensure maximum safety while transporting or moving the unit, the following precautions are recommended:

- Before moving, disconnect all peripheral cables from the system.
- While moving the unit, follow all safety precautions, as described in the *Safety Precautions for Moving the Vivid-i™ Unit* section, below.
- When transporting the unit by vehicle, or shipping by air or any other means:
  - Eject the lithium ion battery from the unit and replace it with the dummy battery.
  - Pack the unit in the original packing. Refer to the information in Unpacking the Cardboard Shipping Carton on page 3 - 8.
  - Follow all safety precautions.
  - Handle with care.
- When reinstalling the unit, always check *both* ends of any cable connections to the system (e.g. peripherals) to ensure cables are properly connected. Confirm that all switches are in the correct position (e.g. the power switch on the DVD/CD-RW device). Allow sufficient system acclimation time, as described in the *System Acclimation Time* section, on page 3-2.

3-9-1 Safety Precautions for Moving the Vivid-i™ Unit

CAUTION: Whenever moving the Vivid-i™ ultrasound unit while mounted on the SafeLock Cart, always observe the following safety precautions:

1) Proceed cautiously when crossing door or elevator thresholds. Grasp the front handle grips or the back handle bar, and then push or pull. **DO NOT** attempt to move the unit by pulling its cables or probe connectors.
2) Ensure that the unit does not strike walls or door frames.
3) Ensure that the pathway is clear.
4) Move the unit slowly and carefully.
5) Take extra care while moving the unit long distances and on inclines.
6) Avoid ramps with an incline of greater than ten degrees to prevent the unit from tipping over. Once the destination is reached, lock the front wheel brakes.

3-9-2 Cardboard Shipping Carton and Packaging Materials

Verify that the required packing materials are available. All these materials are required to safely package and transport the Vivid-i™ ultrasound unit (and SafeLock Cart, if applicable) in the cardboard shipping carton for shipment by vehicle, or any other means.

For more details, refer to the appropriate procedure for Unpacking the Cardboard Shipping Carton on page 3 - 8 and follow the instructions in reverse order.

Section 3-10
Completing the Installation Paperwork

NOTE: On completion of a Vivid-i™ ultrasound scanner installation, it is important to record the relevant System Installation details (see Table 3-27 below) and Product Locator Installation details (see Figure 3-163 on page 3-159), for future reference.

3-10-1 System Installation Details

Enter the serial number printed on the main label (refer to the *Product Labels and Icons* section, on page 1-9), and the other relevant system installation details into the following table:

Table 3-27 System Installation Details

System S/N:	
Location:	
Date:	
Customer Name:	
Service Engineer's Name:	
Comments:	

3-10-2 Product Locator Installation

NOTE: During and after installation, the documentation (i.e. User Manuals, Installation Manuals...) for the peripheral units must be kept as part of the original system documentation. This will ensure that all relevant safety and user information is available during the operation and service of the complete system.

1) Verify that all details have been entered in the System Installation Details form, as described in the *System Installation Details* section, above. If this form has not been completed, enter the details now.
2) Locate the Product Locator Installation Card(s) that are affixed to the monitor and to each of the peripherals, and fill in all details on both the front and back of the card(s) - see Figure 3-163 on page 3-159.

Note: Step 2 may have been completed already by GE personnel.
The Product Locator Installation Card shown in Figure 3-163 may not be identical to the card(s) provided.

Figure 3-163 Product Locator Installation Card (ICD)

3.) Mail the Product Locator Installation Card(s) to the appropriate product center.

3-10-3 User Manual(s)

Check that the correct *Vivid-i™ User Manual(s)* for the system (and relevant software revision), is included with the installation. Specific language versions of the *Vivid-i™ User Manual* may also be available. Check with your GE Sales Representative for availability.

During and after installation, supplementary documentation (such as, *User Manuals* and *Installation Manuals* for the peripherals) must be kept as part of the original system documentation. This will ensure that all relevant safety and user information is available during the operation and service of the complete system.

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Chapter 4
Functional Checks

Section 4-1
Overview

4-1-1 Purpose of Chapter 4

This chapter describes the functional checks that must be performed either as a part of the installation procedure, or as required during servicing and periodic maintenance of the Vivid-i™ ultrasound scanner.

Note: Refer to *Chapter 7 - Diagnostics/Troubleshooting* for detailed descriptions of some of the functional checks described in this chapter.

Table 4-1 Contents in Chapter 4

Section	Description	Page Number
4-1	Overview	4-1
4-2	General Procedures	4-2
4-3	Functional Check	4-17
4-4	System Turnover Checklist	4-32
4-5	Site Log	4-33

4-1-2 Specific Equipment Required

- An empty (blank) MO Disk;
  - P/N: 066E0490 (1.3 GB)
  - P/N: 066E0519 (5.4 GB)
  - P/N: 066E0514 (8.6 GB)
- ECG Pads
- ECG Cable:
  - AHA/AMERICAS, P/N:2378938

    OR
  - IEC / EUROPE, ASIA, ROW, P/N: 2378938-2
- At least one probe (ideally you should check all the probes used on the system by the site.)

  See Available Probes on page 3 - 50, for an overview of available probes.

Section 4-2
General Procedures

4-2-1 Overview

Since some general procedures are used more than others, for convenience, all the procedures described in this section are listed below:

- *Service Dongle (HASP)* section, below
- *Exit to Windows from the Vivid-i™ Application section*, page 4-4
- *Power ON/Boot-up section*, page 4-4
- *Power Shut Down section*, page 4-8
- *Log On to the System as ADM section*, page 4-11
- *Using Removable Media section*, page 4-12
- *Labeling Removable Media section*, page 4-14
- *Formatting Removable Media section*, page 4-14
- *Verifying Removable Media section*, page 4-14
- *Archiving and Loading Presets section*, page 4-15

4-2-2 Service Dongle (HASP)

A Service Dongle and a proprietary GE Service password are necessary for use by GE Service when performing proprietary level diagnostics such as, accessing the desktop on the BEP. The password changes at specific intervals.

1.) Power down the unit, see section 4-2-5 on page 4-9.

2.) Ensure that your Service Dongle is connected to the USB port at the rear of the system.

Figure 4-164 Service Dongle Connected to USB Port

3.) Power ON the unit, see section 4-2-4 on page 4-5.

During boot-up, if a Service Dongle is plugged in, the system detects the dongle and then displays the Maintenance Access dialog box, as shown below.

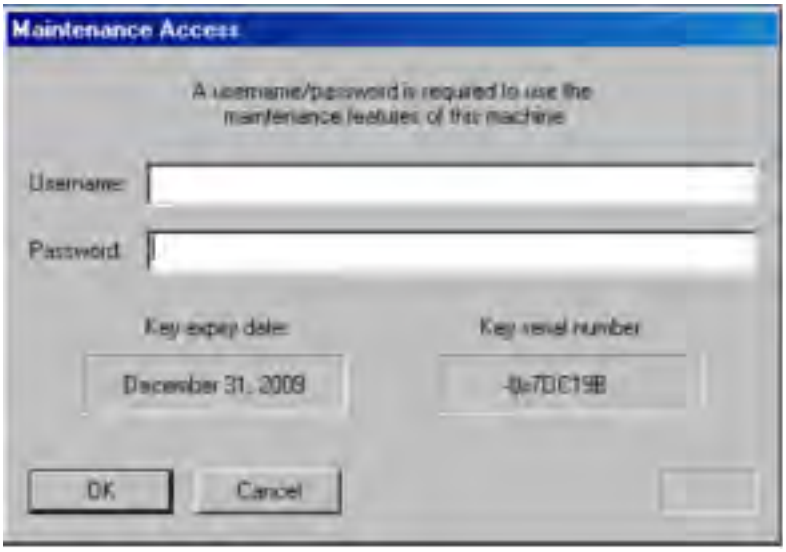


Figure 4-165 Maintenance Access Dialog Box

4) Leaving the User Name field empty, type the current GE service password in the **Password** field.

5) Click **OK**.

   The following important message is displayed:

   READ THIS NOTE BEFORE CONTINUE:
   After you have pressed OK, the Start Application dialog will be displayed on screen. Be ready to *press* MAINTENANCE... *before the Time Bar is "full", or the Vivid-i application software will be started. (A description on how to recover, if you fail to click* MAINTENANCE *is included, but you will spend extra time doing this).*

6) After reading the message, click **OK**.

   The Start Application dialog box is displayed

7.) Click the **Maintenance** button to enter *Maintenance Mode*.

The Maintenance dialog box is displayed:

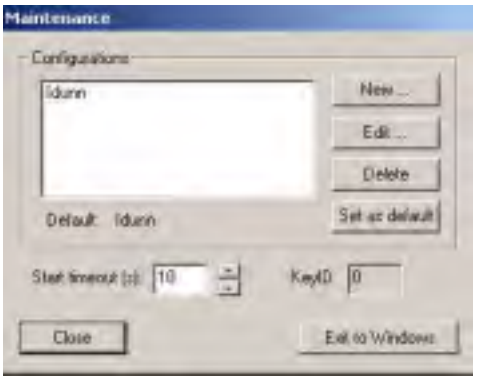


Figure 4-166 Maintenance Dialog Box

8.) Click the **Exit to Windows** button to display the Windows Desktop on the screen.

4-2-3 Exit to Windows from the Vivid-i™ Application

NOTE: Follow these steps if you want to exit to the Windows Desktop when the Vivid-i™ application is active. The Service Dongle must be plugged in to one of the USB ports.

1.) On the Alphanumeric Keyboard, press <**Ctrl**>+**Alt**+**R**.

This will display either the Start Application dialog box (continue with step 2), or the Maintenance dialog box (continue with step 3).

2.) If the Start Application dialog box is displayed, click **Maintenance** to enter *Maintenance Mode*.

This will display the Maintenance dialog box.

3.) In the Maintenance dialog box, select **Exit to Windows**.

This will display the Windows Desktop on the screen.

4-2-4 Power ON/Boot-up

4-2-4-1 Connecting Mains Power to the Vivid-i™ Ultrasound Unit

DANGER: To avoid the risk of fire, power to the system must be supplied from a properly rated outlet. It is recommended to use a dedicated power outlet. The power plug should not, under any circumstances, be altered to a configuration rated less than that specified for the current. DO NOT use an extension cord or adaptor plug. Refer to the *Electrical Requirements* section, on page 2-3 **for more details.**

DANGER: ALWAYS CONNECT THE UNIT TO A FIXED POWER SOCKET WHICH HAS THE PROTECTIVE GROUNDING CONNECTOR.

DANGER: NEVER USE A THREE-TO-TWO PRONG ADAPTER; THIS DEFEATS THE SAFETY GROUND.

DANGER: ENSURE THAT THE POWER CORD AND PLUG ARE INTACT AND THAT THE POWER PLUG IS THE PROPER HOSPITAL-GRADE TYPE (WHERE REQUIRED).

NOTICE Use only power supply cords, cables and plugs provided by or designated by GE Medical Systems.

CAUTION: The system requires all covers.
Operate this unit only when all board covers and frame panels are securely in place. The covers are required for safe operation, good system performance and cooling purposes.

NOTE: When turning on a system from standby mode, it takes a few seconds before it responds. Do not push the On/off button again during this period. A second push will initiate a full shutdown.

NOTE: If the unit has been in the OFF condition for an extended period of time, (3 to 5 days or more), the unit may not boot, or may beep when turned on. .

Follow These Steps to Connect Mains Power to the Unit

Connecting the Vivid-i™ ultrasound unit involves preliminary checks of the power cord, voltage level and compliance with electrical safety requirements.

1) Ensure that the wall outlet is of appropriate type, and that the power switch is turned OFF.
2) Uncoil the power cable, allowing sufficient slack so that the unit can be moved slightly.
3) Verify that the power cable is without any visible scratches or any sign of damage.
4) Verify that the on-site mains voltage is within the limits indicated on the rating label on the base of the Vivid-i™ portable ultrasound scanner.
5.) Connect the Mains Power Cable female plug via the AC Adapter to the Power Inlet (DC IN - refer to Figure 4-167) at the rear of the unit.

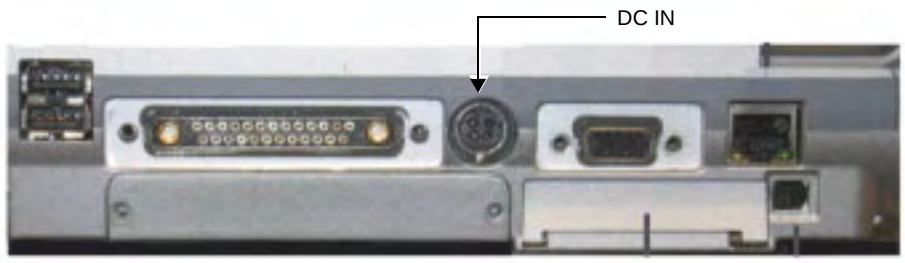


Figure 4-167 Mains Power Connector - Rear Panel

6.) Connect the other end (male plug) of the Mains Power Cable to a hospital-grade mains power outlet with the proper rated voltage.

The unit is now ready for Power ON/Boot Up.

4-2-4-2 Turning the System ON

1) Verify that the ultrasound unit has been connected to the mains power wall outlet via the AC connector on the rear of the system (as previously described) and that mains power is turned ON.

NOTICE When AC power is applied to the scanner, the **On/Off** button on the control console illuminates amber, indicating the Back-end Processor is in *Standby* mode.

2) Hold down the **On/Off** button (Figure 4-168) on the control panel for 3 seconds. The system automatically performs an initialization sequence which includes the following:

- Loading the operating system.
- Running a quick diagnostic check of the system.
- Detecting connected probes.

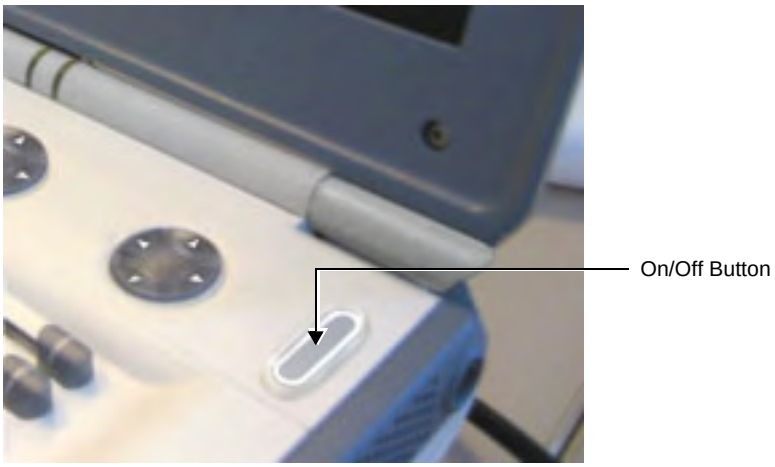


Figure 4-168 On/Off Button on Control Panel

During a normal boot, you may observe that:

a.) The unit's ventilation fans starts on full speed, but slow down after a few seconds (listen to the fan noise).

b.) Power is distributed to the peripherals, Operator Panel (control panel), Monitor, Front-End Processor and Back-End Processor.

c.) The Back-End Processor and rest of the scanner starts with the sequence listed in the following steps:

1.) Back-End Processor is turned ON and starts to load the software.

2.) The Start Screen (Vivid) is displayed on the monitor.

3.) A start-up progress bar indicating the time used for software loading, is displayed on the monitor, as shown in Figure 4-169.

Figure 4-169 Start-up Progress Bar

4.) The software initiates and sets up the Front-End electronics and the rest of the scanner.

5.) The Keyboard backlight is lit.

6.) As soon as the software has been loaded, a 2D screen is displayed on the monitor, as shown below.

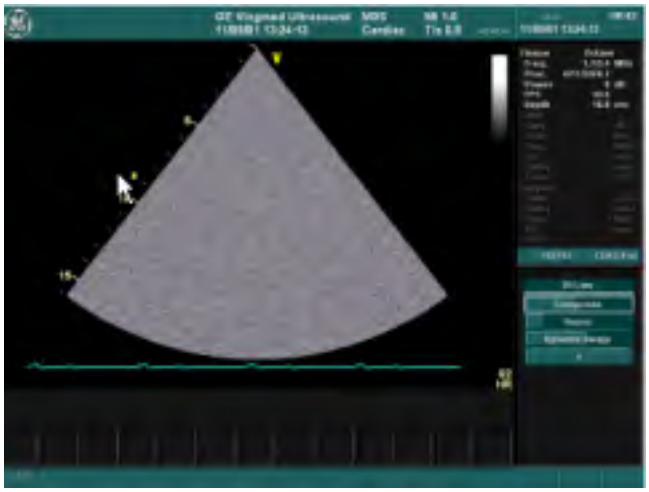


Figure 4-170 2D Screen

NOTE:Total time used for start-up is typically three minutes.

4-2-5 Power Shut Down

When switching the unit OFF, the system performs an automatic shutdown sequence.

NOTE: After turning OFF the system, wait at least 10 seconds before turning it on again. The system may not be able to boot-up if power is recycled too quickly.

The system can be switched OFF in one of three ways, as follows:

- Holding down the **On/Off** button for 3-5 seconds will evoke the display of the System Exit dialog box (see Figure 4-171). From this, you can either select *Full Shutdown* (click the **Shutdown** button) or choose to place the system in *Standby Mode* (click the **Standby** button). Both these procedures are described in detail below..

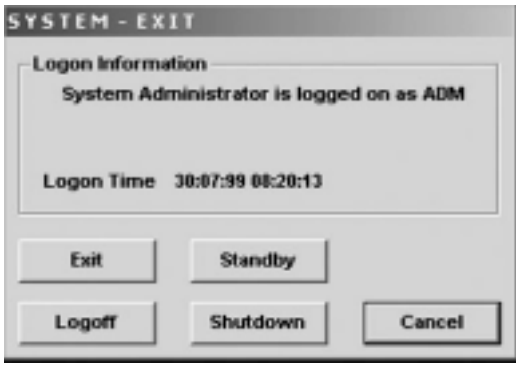


Figure 4-171 System Exit Dialog Box

- Holding down the **On/Off** button for more than 10 secs will cause the system to perform *Emergency Shutdown.* This is not recommended under normal circumstances.
- Closing the lid will place the system in *Standby Mode*.

Note: The system will remain in *Standby Mode* for as long as battery power will allow.

The System - Exit dialog box (Figure 4-171), used when switching OFF the unit, gives you the choices described below.

- **Standby**
  Use this button to select the Standby mode, allowing a shorter reboot time. Most of the system is powered down, but a certain portion of the unit remains energized. The standby mode allows a shorter re-boot time when the system is used on a daily basis or moved from one place to another.
- **Logoff**
  Use this button to log off the current user.
  The system remains ON and ready for a new user to log on.
  (If the Logoff button is dimmed, it indicates that no user is logged on to the unit at the moment.)
- **Shutdown**
  Use this button to Shut Down the system. The entire system is shut down. It is recommended to perform a full shutdown at least once a week.
- **Cancel**
  Use this button to exit from the System - Exit dialog box and return to the previous operation.

4-2-5-1 Standby Mode

Follow the steps below to select Standby Mode

This procedure describes the steps required to power down the unit to Standby mode:

NOTE: Don't press the On/Off button too long. If you press the button too long (more than 3-4 seconds), a full shutdown is started.

1.) Hold down the **On/Off** button for 3-5 seconds to evoke the display of the System Exit dialog box (see Figure 4-171 on page 4-8).
2.) Click the **Standby** button to activate Standby mode.
3.) Leave the mains power cable connected to keep the standby battery fully charged.

Follow steps below if you need to disconnect power cable when unit is in standby mode

1.) Switch OFF the Mains Power from the wall outlet.
2.) Disconnect the power cable.

The system will remain in Standby mode for approximately 15 minutes if the standby battery is fully charged. If the system is unplugged for a longer period of time, a full shutdown is automatically performed.

As described above, the battery is automatically charged when the system is plugged to the wall outlet and the power is switched ON. It takes approximately 10 hours to charge a flat battery.

If the system is left in the OFF condition (system unplugged from the wall out let) for an extended period of time (3 to 5 days or more), the system may not boot up or may beep when turned ON. Should this occur, the system needs to recharge the batteries. This could take 15 minutes to as long as 10 hours, depending on the battery age, system input voltage and system temperature. To eliminate draining the batteries, the system should remain plugged into the wall outlet with the wall outlet power switch in the ON position.

NOTE: Connect the power cable to the mains power outlet again as soon as possible and at least before you switch on the mains power and press the On/Off button.

NOTE: When turning ON a system from standby mode, it takes a few seconds before it responds. Do not push the On/Off button again during this period. A second push will initiate a full shutdown.

4-2-5-2 Complete Power Down

NOTE: This function is not available from Standby mode.

Follow this procedure to perform a complete system power-down

1.) Hold down the **On/Off** button for 3-5 seconds to evoke the display of the System Exit dialog box (see Figure 4-171 on page 4-8).

2.) Select **Shutdown** to do a complete power down of the unit.

The Back-End Processor will first turn OFF the scanner activity and print the message "*Please wait - Shutdown in progress*" in the LCD display. Then system shut down commences.

The time required to power down the unit (including the Back-End Processor), may vary from 10 seconds up to approximately 1 minute. The last component that shuts down is the light in the LCD display, indicating that you may continue with the next step.

3.) Disconnect the mains power from the wall outlet. This will cut power distribution within the unit.

If the system is still running when you disconnect the mains power, the internal power supply will switch over to the battery power and supply the system with power until either the battery is drained to 30% capacity (invoking shut down), or shutdown has been invoked by the user.

NOTE: To completely remove power from the system, release and remove the battery.

4-2-6 Log On to the System as ADM

Table 4-2 Logging on to the System as ADM

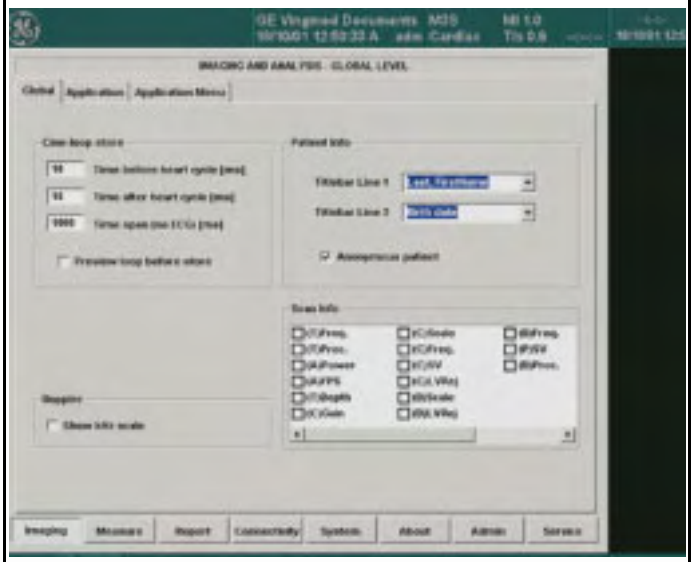
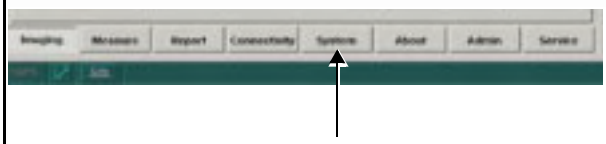
Step	Task	Expected Result(s)
1.	Press **Config** on the alphanumeric keyboard.	If not already logged on, the Operator Login window is displayed. Note: The default password is **ulsadm**
2.	Select the down-arrow to the right of the Operator field to view the Operator pull down list From the factory, these two users are defined without password. - adm - usr It is possible for the administrator (*adm*) to establish unique passwords for each user, but don't do it now.	
3.	Select the user *adm*. - From the factory, the password has been left blank, so you may try to log on without any password. - If the log-on fails, you may try to use the password **service**. - As a last resort, contact the hospital's network administrator (or person responsible for the ultrasound unit), and ask for the password. The Emergency button stores data only from current patient examination.	
4.	Select **Log on**.	- If this is the first time the unit is turned on, the "IMAGING AND ANALYSIS - GLOBAL LEVEL" window is displayed. - If another screen was displayed earlier, before logging out or turning unit off, that screen will be displayed. 

Table 4-2 Logging on to the System as ADM (Continued)

Step	Task	Expected Result(s)
5.	Select System to access the System Setup window. 	The System Settings window is displayed
6.	Proceed to select the required settings.	

4-2-7 Using Removable Media

4-2-7-1 Introduction

Vivid-i™ is equipped with a Magneto Optical Disk Drive (MO Drive) and a DVD/CD-RW Drive.

The MOD Drive can be connected to either of the USB ports (*upper* or *lower*) on the rear connectors panel. This connection must be via a USB-to-SCSI adaptor; one side of the adaptor being connected to the Vivid-i™ USB port, and the other side to the rear of the MOD drive.

When connecting the MOD drive directly to the system, it is necessary to use an additional power source. **As a safety precaution, this must be done via an isolation transformer.**

The MOD Drive may be connected once the system is powered ON, or after shutdown. All software drivers for the MOD Drive are pre-configured and installed designated to be used with the specific MOD drive supplied by GE Medical Systems.

WARNING ***Do not attempt to use a different type of mass storage device other than the MOD Drive supplied with the system. The ultrasound system is an extremely sensitive and complex medical system. Any unauthorized peripherals may cause system failure or damage!***

4-2-7-2 Install MO Disk in MO Drive

NOTICE **Never move the unit with a MO disk in the Magneto Optical Disk Drive because the drive actuator will not be locked and the Magneto Optical Disk Drive could break.**

1.) Preparations before installing an MO disk in the MO Drive:

   a.) The unit must be turned ON and "up and running" before using the MO Drive

   b.) Verify the MO disk for loose hardware or damaged labels which could jam inside the MO Drive.

   c.) Ensure that the slide switch in one corner of the disk is set so that the disk is write enabled (disk hole closed).

2.) Insert the disk into the MO Disk Drive with the label for the side you intend to use, facing up.

4-2-7-3 Eject and Remove MO Disk from MO Drive

NOTICE ***Do not eject the MO Disk using the button on front of the MO drive.***

In some cases, the MO Disk is ejected automatically. If not automatically ejected, use the manual ejection method as described in the following steps:

1.) Select the **Eject** button on the screen

OR

Press <**Alt> + E** *on the alphanumeric keyboard to display the Eject Device menu.*

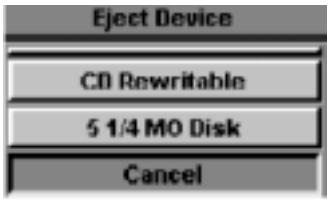


Figure 4-172 Eject Device Menu

2.) Select **5 1/4 MO Disk** in the Eject Device menu to eject the MO Disk.

3.) Remove the ejected MO Disk from the MO Drive and place it in its cover box for storage in a safe place.

4-2-7-4 Install CD-R Disk in CD Drive

1.) Press the Eject button on the right side of the CD Drive once to open the disk tray.

2.) Put a CD-R disk in the disk tray with the label side facing up.

3.) Press the Eject button once to close the disk tray.

After a few seconds, the disk is available for reading, formatting or writing, depending on the type of disk you used.

4-2-7-5 Eject and Remove CD-R Disk from CD Drive

NOTICE ***Do not eject the CD-R Disk using the button on front of the CD Drive.***

In some cases, the CD-R Disk is ejected automatically. If not automatically ejected, use the manual ejection method as described in the following steps:

1.) Select the **Eject** button on the screen

OR

Press <**Alt> + E** *on the alphanumeric keyboard to display the Eject Device menu (Figure 4-172).*

2.) Select **CD-Rewriteable** in the Eject Device menu to eject the CD-R Disk.

3.) Remove the ejected CD-R Disk from the CD Drive and place it in its cover box for storage in a safe place.

4-2-8 Labeling Removable Media

Before you start to format any Removable Media, be sure about what naming convention you will use for labelling.

- Use a logical name and make sure to physically label each Removable Media.
- Verify that each Removable Media is given a unique name. Maximum eleven (11) characters may be used for the label name.
- Remember that MO Disks have two sides, Side A and Side B. Each Side must have a unique name.

Example: MO Disks for storing images may be labeled "IMAGE_1A" (Side A on MO Disk #1), "IMAGE_1B (Side B on MO Disk #2), "IMAGE_2A"...

4-2-9 Formatting Removable Media

This procedure describes how to format an MO Disk or a CD-R disk.

Before you continue, be sure about what naming convention you will use for labelling the Removable Media.

1.) Select **Config** > **Connectivity** > **Media.**

2.) Select the removable media from the *Media pop-up menu*.

3.) Enter a name for the removable media in the *Label field*.

4.) Press **Format**.

5.) Wait for display of the *Information window,* indicating that the formatting process is completed.

NOTICE ***Do not eject the CD using the button on the CD drive.***

6.) Press **<Alt> + E** on the alphanumeric keyboard to display the Eject Device menu (Figure 4-172 on page 4-13)

7.) Select the relevant media.

The selected media is ejected.

4-2-10 Verifying Removable Media

1.) Insert the removable media to be verified.

2.) Select the pre-configured removable media from the **Config** > **Connectivity** > **Media** pop-up menu.

3.) Press **Verify.**

The unit starts to verify the DICOM directory on the selected media.

4-2-11 Archiving and Loading Presets

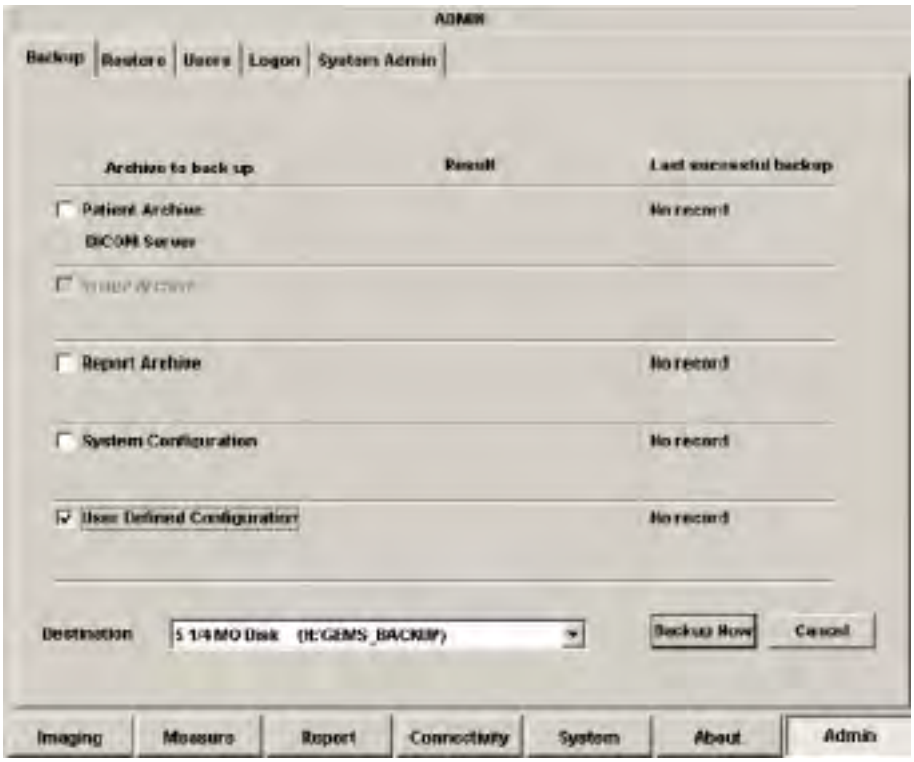
NOTE: Always save presets before any software reload. This action is necessary to ensure that the presets loaded after the software reload are as up–to–date as possible.

All user presets except changes to *Summary*, *Anatomy*, and *Biometry* pages, can be saved on an MO disk for reloading on the system.

NOTICE Presets should not be saved on the same MO disk as images, because the Archive Menu lists the images but not the presets stored on a MO disk.

4-2-11-1 Archiving Presets to an MO Disk

Table 4-3 Saving Presets

STEP	TASK	FUNCTION
1.	Insert an empty, formatted MO disk labelled “PRESETS” and marked with Vivid-i™’s serial number and the date, into the MO Drive. For more information about formatting, see Formatting Removable Media on page 4 - 14.	
2.	Press **Config** (or **F2**); select **Admin** then select **Backup**.	The Backup window is displayed. 
3.	Enable the **User Defined Configuration** check box.	
4.	Select the MOD as the Destination.	
5.	Press **Backup Now**.	A copy of the Presets is saved on the MO disk.
6.	Press <**Alt> + E** on the alphanumeric keyboard.	The MO disk is ejected.

4-2-11-2 Loading Presets from an MO Disk

Table 4-4 Loading Presets

STEP	TASK	FUNCTION
1.	Insert the MO disk with the archived presets into the MOD.	
2.	Press **Config** (or **F2**); select **Admin** then select **Restore**.	The Restore window is displayed.
3.	Enable the **User Defined Configuration** check box.	
4.	Select the MOD as the Source.	
5.	Press **Restore Now**	The Presets are restored to the System.
6.	Press <**Alt> + E** on the alphanumeric keyboard.	The MO disk is ejected.

Section 4-3
Functional Check

4-3-1 Basic Controls

4-3-1-1 Alphanumeric Keyboard Test

Table 4-5 Alphanumeric Keyboard Test

Step	Task	Expected Result(s)
1	Power-up the System in Normal Scanning Mode	
2	Press **Config** and select **Report**	
3	Select the **Comment Text** Tab	
4	Press all Alphanumeric keys one-by-one. To quickly test every key (each letter in the alphabet), type the following sentence: *The quick brown fox jumps over the lazy dog* Repeat the test, while holding down the Shift key.	As each key is pressed, the corresponding letter is typed on the screen.
5	Use the **Backspace** key to delete the text you typed.	

4-3-1-2 External Keyboard Test

NOTE: The External Keyboard test also includes testing of the following components: TGC Sliders, Rotary, Keyboard backlight, Button backlight, and Active Button.

Table 4-6 External Keyboard Test

Step	Task	Expected Result(s)
1	Power-up the System in Normal Scanning Mode	
2	Press **<Alt> F2** to start the diagnostic package.	
3	Highlight the **Keyboard Test** and press <**Start**>	The keyboard Test window opens
4	Trackball to **Connect** and press **Set.**	
5	Press all extended KB keys one-by-one. Press the **Clear** soft button to clear the Event window.	The extended KB keys activate properly. Every hit on a key is followed by two rows (Depress/Release).
6	Perform the TGC Slider Test, as follows: d.) Move all TGC sliders to the *left* position	The position value is 0 (+2) for all TGC Sliders
	e.) Move all TGC sliders to the *right* position	The position value is 63(-2) for all TGC Sliders
	f.) Move all TGC sliders to the *central* position	The position value is 31(±2) for all TGC Sliders
7	Perform the **ROTARY TEST**, as follows: Rotate the rotary (in both directions) and press the button at the center of the rotary.	The rotary is activated properly; pressing on the button will display a row of data for pressing and another row of data for releasing (Depress/Release).

Table 4-6 External Keyboard Test (Continued)

Step	Task	Expected Result(s)
8	Perform the **ALPHANUMERIC KEYBOARD BACKLIGHT TEST**, as follows: a.) Change the combo box near the **Front Panel** button to **Reset to power up conditions** and press the **Front Panel** button	
	b.) Change the combo box near **Front Panel** button to **Enable transmission** and press the **Front Panel** button.	
	c.) Set the Keyboard Backlight to 255	All Alphanumeric Backlight LEDs are seen with same intensity acceptable for the maximum level.
9	Perform the **BUTTON BACKLIGHT TEST**, as follows: a.) Change the combo box near the **Front Panel** button to **Reset to power up conditions** and press the **Front Panel** button	
	b.) Change the combo box near **Front Panel** button to **Enable transmission** and press the **Front Panel** button.	
	c.) At the **Indicators** frame set Indicator – ID to the **All** position. Select **ON** and **Backlights**.	
	d.) Press the **Test Software** button	All Backlight LEDs except the TGC sliders and the Rotary are seen with same intensity acceptable for the maximum level.
10	Perform the **BUTTON ACTIVITY TEST**, as follows: a.) Change the combo box near the **Front Panel** button to **Reset to power up conditions** and press the **Front Panel** button	
	b.) Change the combo box near **Front Panel** button to **Enable transmission** and press the **Front Panel** button.	
	c.) At the **Indicators** frame set Indicator – ID to the **All** position. Select **ON** and **Activity**.	
	d.) Press the **Test Software** button	All 10 Activity green LEDs and KB backlights are seen with maximal intensity

Table 4-6 External Keyboard Test (Continued)

Step	Task	Expected Result(s)
11	Perform the **STATUS INDICATOR TEST**, as follows: a.) Check the **Battery green** check box. Press **Set**.	Battery green LED is On
	b.) .Uncheck the **Battery green** check box. Check the **Battery yellow** check box**.** Press **Set**	Battery yellow LED is On
	c.) Uncheck the **Battery yellow** check box. Check the **Extern DC green** check box**.** Press **Set**	Extern DC green LED is On
	d.) Uncheck the **Extern DC green** check box. Check the **Extern DC yellow** check box**.** Press **Set**	Extern DC yellow LED is On
12	Perform the **LID BUTTON TEST**, as follows: a.) Press the **Diagnostic Info** button.	
	b.) Place the test upper cover magnet close to the Alphanumeric Keyboard Escape button.	The status of the Lid switch is “Open” and changes to “Closed “after the magnet was placed.
13	Perform the **POWER BUTTON TEST**, as follows: a.) Press the **Diagnostic Info** button. Press the **Power** button.	The status of the Power Button is “Open” and changes to “Closed “when the power button is pressed.
	b.) Press the **Disconnect** and **Close** buttons to close the test application.	

4-3-1-3 Trackball Test

Table 4-7 Trackball Test

Step	Task	Expected Result(s)
1	Boot-up the System in Regular Scanning Mode	
2	Press **Config**	
3	Under the **Connectivity** tab, select **TCPIP** then **Advanced Settings**	
4	Click on **View**	
5	In the address bar, type **Desktop** and press <**Enter**>	
6	Select **My Docs** > **My Picture**s and double-click on one of the pictures to open the Paint application.	
7	From the Paint window, make sure that when moving the trackball you have good control and that the x and y coordinate values (displayed at the bottom of the screen) move digit-by-digit up and down.	Movement is smooth (no jumping) and the trackball has no “dead” areas (i.e., when the trackball is moved there are no areas in which no changes are seen).

4-3-1-4 System ID Test

Table 4-8 System ID Test

Step	Task	Expected Result(s)
1	Boot-up the System in Regular Scanning Mode	
2	Press **Config**	
3	Under the **Connectivity** tab, select **TCPIP** then **Computer Name**	
4	Make sure the computer name is System ID	
5	Select **Advanced Settings**	
6	Type **Desktop** and press <**Enter**>	
7	Select **My Computer** and press **Menu**	
8	From the drop-down menu, select **Properties** and then select the **Computer Name** tab.	
9	Make sure the System ID is indicated under the computer description.	The computer description matches the system ID.

4-3-1-5 Speakers Tests

Table 4-9 Speakers Test

Step	Task	Expected Result(s)
	BEP Path:	
1	Boot-up the System in Regular Scanning Mode	
2	Press **Alt +Config** to start the diagnostic package	
3	From the diagnostic test tree, select **BEP**. This will activate PC Doctor diagnostics.	
4	Run **System Diagnostics\Audio Test**	
5	At the WAV window, press the **Left Channel** button	Make sure that the *left* internal speaker is working Verify that there is clear sound from both speakers at all frequencies. Note that *right* and *left* are as seen when standing behind the unit.
6	At the WAV window, press the **Right Channel** button	Make sure that the *right* internal speaker is working Verify that there is clear sound from both speakers at all frequencies. Note that *right* and *left* are as seen when standing behind the unit.
	RFI Path:	
1	From the diagnostic test tree, select **Front End Test** > **RFI**. Then select **RFI Audio Test** and press **Start**.	During the test, a high-pitched sound will be heard from the *left* and *right* speakers simultaneously and the circuitry test will indicate Pass

4-3-1-6 Microphone Test

Table 4-10 Microphone Test

Step	Task	Expected Result(s)
1	Boot-up the System in Regular Scanning Mode	
2	Press **Alt +Config** to start the diagnostic package	
3	From the diagnostic test tree, select **BEP**. This will activate PC Doctor diagnostics.	
4	Run **System Diagnostics\Microphone Test**	
5	At the PCDR Microphone window, press the **Record** button and start talking “1, 2, 3, 4, 5”	
6	When done, press **Play**	The playback sounds loud and clear.
7	When done, press **Close** The system will prompt: Did the test pass? Respond accordingly.	

4-3-1-7 Monitor Test

This procedure is performed in stages, in the order shown in the table below. First, verify the monitor settings and then proceed with the tests that follow.

Table 4-11 Monitor Test

Step	Task	Expected Result(s)
	VERIFY MONITOR SETTINGS	
1	Boot-up the System in Regular Scanning Mode	
2	Press **Config**	
3	Under the **Connectivity** tab, select **PCPIP**	
4	Select **Advanced**	
5	In the address bar, type **Controlbar** and press **Enter**	
6	From the Control Panel, select **Display** then select **Settings**	Make sure resolution is set to 800 x 600 pixels, 16 bit. If not, select the correct resolution settings.
7	From the **Settings** Tab, select **Advanced**. Select **S3GammaPlus** tab	Make sure the settings are: • Gamma = 0.7 • Brightness = 1 • Contrast = 1
8	When done, press **OK** to close all windows.	
	LCD PIXEL TEST:	
1	Boot-up the System in Regular Scanning Mode	
2	Press **Alt +Config** to start the diagnostic package	

Table 4-11 Monitor Test (Continued)

Step	Task	Expected Result(s)
3	From the diagnostic test tree, select **BEP**. This will activate PC Doctor diagnostics.	
4	Run **System Diagnostics\Monitor Test**	
5	Select **Solid Test**.	No missing pixels in R/G/B tests
6	Select **Red**	Make sure there are no missing pixels in the Full Screen Red or display in another color
7	Select **Green**	Make sure there are no missing pixels in the Full Screen Green or display in another color
8	Select **Blue**	Make sure there are no missing pixels in the Full Screen Blue or display in another color
9	When done, press **Close** The system will prompt: Did the test pass? Respond accordingly.	
	EXTERNAL MONITOR TEST:	
1	Connect the external monitor to the system	
2	Boot-up the System in Regular Scanning Mode	
3	Press **Config**	
4	Under the **Connectivity** tab, select **PCPIP**	
5	Select **Advanced**	
6	In the address bar, type **Controlbar** and press **Enter**	
7	From the Control Panel, select **Display** then select **Settings**	
8	From the **Settings** Tab, select **Advanced**. Select **S3Display** tab	Make sure the CRT check box is activated.
9	When done, press **OK** to close all windows.	
10	Press **Alt +Config** to start the diagnostic package,	
11	From the diagnostic test tree, select **BEP**. This will activate PC Doctor diagnostics.	
12	Run **System Diagnostics\Monitor Test**	
13	Select **Combination Test**.	
14	Follow the on-screen instructions.	PASS
15	When done, press **Close** The system will prompt that the test passed.	

4-3-1-8 ECG Test

Table 4-12 ECG Test

Step	Task	Expected Result(s)
1	Boot-up the System in Regular Scanning Mode	
2	Connect the ECG cable to the input on the ECG port on the right side of the Vivid-i™ scanner. Connect the ECG leads to yourself (as the simulated patient).	
3	Press **Alt + Config** to enter into Diagnostics Mode	
4	From the Diagnostic Test tree, select **BEP**.	
5	Run the **ECG Test**	
6	From the Test ECG device window, set the resolution to 1 second and press the **Open Device** button	Verify that a single clear QRS signal is displayed.
7	Switch on the ECG simulator, Set Amplitude to 1.5, Set Rotary to 11	
8	When done, press **Exit** button	

4-3-1-9 Front End Test

Table 4-13 Front End Test

Step	Task	Expected Result(s)
1	Boot-up the System in Regular Scanning Mode	
2	Press **Alt + Config** to enter Diagnostics Mode	
3	From the Diagnostic Test tree, select **Front End Tes**t.	
4	Run **Full System Test** and press **Start**	PASS
5	Connect the 3S-RS probe to the probe port.	
6	From the Diagnostic Test tree, select **Front End Test**.	
7	Select **TR32** then select **TX**. Select **TXProbeTX Tes**t and press **Start**	PASS
8	Select **MUX Test** then select **3S-RS Test** and press **Start**	PASS
9	Select **TR32 Test** then select **RX Tes**t. Select **RSTest with 3S-RS** and press **Start**	PASS
10	When done, press the **Esc** button	

4-3-1-10 CW Test

Table 4-14 CW Test

Step	Task	Expected Result(s)
1	Boot-up the System in Regular Scanning Mode	
2	Press **Alt + Config** to enter Diagnostics Mode	
3	From the Diagnostic Test tree, select **Front End Test**.	
4	Run **Full System Test** and press **Start**	PASS
5	Connect the 3S-RS probe to the probe port.	
6	From the Diagnostic Test tree, select **Front End Tes**t.	
7	Select **TR32** then select **TX**. Select **TXProbeTX Test** and press **Start**	PASS
8	Select **MUX Test** then select **3S-RS Test** and press **Start**	PASS
9	Select **TR32 Test** then select **RX Tes**t. Select **RSTest with 3S-RS** and press **Start**	PASS
10	When done, press the **Esc** button	

4-3-1-11 Visual Test

Table 4-15 Visual Test

Step	Task	Expected Result(s)
1	Insert 3S-RS probe.	
2	Increase the gain to see the homogenous noise.	The probe ID is 3S-RS. No strikes or artefacts are present.

4-3-2 Peripherals

4-3-2-1 VCR Test

Table 4-16 VCR Test

Step	Task	Expected Result(s)
1	Connect a Mitsubishi 9600 VCR and video converter to the system, restart the system and load an SVHS cassette.	Verify that you follow all the procedure instructions described in Connecting the VCR on page 3 - 41.
2	Connect an external monitor to the VCR S-Video or Video output.	
3	Connect a 3S-RS probe. Reset the VCR counter and press the **VCR Record** button.	Verify that the recording indicator (red dot) is displayed on the VCR and the tape counter is running on the VCR.
4	Activate CW Mode and record 2 minutes of heart scanning or a similar effect using a phantom.	Record 2 minutes of CW scanning.
5	Stop recording and rewind the cassette. Press the **Play** button on the VCR.	The recorded Image is played back.
6		Verify that in CW Mode both the *left* and *right* audio channels are working, and that the played-back audio is similar to the recorded audio in both the *left* and *right* speakers, when applicable.

4-3-2-2 B/W and Color Printer Test

Table 4-17 B/W and Color Printer Test

Step	Task	Expected Result(s)
1	Scan a phantom or suitable interface in 2D-Mode.	
2	Press the **Freeze** button.	The image scanning stops with the latest picture frozen on the screen.
3	Press the **Print** button.	Evaluate the print quality. Adjust the *brightness* and/or *contrast* of the B/W printer, if required. The image displayed on the screen is printed on the B/W or color printer, depending upon the key assignment configuration (refer to
1	Scan a blood vessel in 2D-Mode or a phantom simulating a similar CFM effect, then activate CFM to see color.	
2	Press the **Freeze** button.	
3	Press the **Print A** button.	Evaluate the color print quality. Adjust the *brightness* and/or *contrast* of the Color printer, if required.

4-3-2-3 Color Printer Test

Table 4-18 Color Printer Test

Step	Task	Expected Result(s)
1	Scan a blood vessels in 2D-Mode or a phantom simulating a similar CFM effect, then activate CFM to see color.	
2	Press the **Freeze** button.	
3	Press the **Print A** button.	Evaluate the color print quality. Adjust the *brightness* and/or *contrast* of the Color printer, if required.

4-3-3 SafeLock Cart Functional Tests

NOTE: In the event that when mounting the Vivid-i™ portable ultrasound scanner on the SafeLock Cart, the unit does not lock firmly in position when inserted into the safelocks (or, if when removing the unit from the Cart, it is difficult to disengage the safelocks), it is necessary to perform the alignment procedure as described in Adjusting the SafeLock Cart Locking Mechanism on page 3 - 58.

4-3-3-1 Main Shelf Movement Test

Table 4-19 Main Shelf Movement Test

Step	Task	Expected Result(s)
1	Lift the release handle located on the *left* side of the SafeLock Cart *upwards*.	The locking mechanism of the up and down movement is released, allowing the main shelf to be raised.
2	While lifting the release handle, raise the shelf upwards and make sure it is able to reach its maximum height.	Ensure that you do not apply too much force to move the main shelf and that the shelf movement is smooth.
3	Press the release handle down, while pushing the main shelf back *downwards* to return it to its lowest position.	The main shelf returns to its lowest position.

4-3-3-2 Brakes Function Test

Table 4-20 Brakes Function Test (Front Castor Wheels)

Step	Task	Expected Result(s)
1	Release the wheel lock (upper lever) on each front castor wheel by pulling it *upwards*. Push and pull the unit right, left, backwards and forwards.	Ensure that the wheels move freely in all directions. Check the wheels for wear and tear, and replace if necessary.
2	Press the foot brake (lower lever) *down* on each front castor wheel to lock the wheels in position. Push and pull the unit right, left, backwards and forwards.	Ensure that the wheels are locked and there is no movement in any direction.

4-3-3-3 SafeLock Cart USB Test

Table 4-21 SafeLock Cart USB Functional Test

Step	Task	Expected Result(s)
1	Plug the service dongle (Technical Support plug) into one of the USB ports on the SafeLock Cart.	
2	Switch ON power to the SafeLock Cart.	
3	With the Vivid-i™ scanner mounted into position on the cart, switch ON power to the scanner.	The red LED on the service dongle illuminates.
4	Move the service dongle between each of the four USB ports in turn, checking that the LED illuminates correctly.	The red LED on the service dongle illuminates.

4-3-4 Back End Processor Tests

4-3-4-1 Phono Test (optional)

Table 4-22 Phono Test

Step	Task	Expected Result(s)
1	Connect the microphone to the microphone input on the ECG Board. Note that the special Medical Microphone is required.	
2	Use your finger to click (tap) the microphone.	Verify that the waveform on the screen corresponds to the microphone clicks.

4-3-4-2 Magneto Optical Drive (MOD) Test

Table 4-23 MOD Test

Step	Task	Expected Result(s)
1	Restart the system performing a full shutdown and bootup, as described in Power ON/Boot-up on page 4 - 4.	During the boot-up process, verify that the messages **SCSI Adaptor Installation 2271149-2INS** and **MO** are displayed.
2	Insert a new MO Media Sony EDM-2300B (2.3G) into the MOD.	
3	Press **Ctrl+F11** (or **Alt+D**) on the keyboard and select <Back End>, <Media Driver> and <MO>, as appropriate.	**The UtilMediaApp** dialog box is displayed.
4	Select the **IsMediaAcces** button.	The message **Media in drive G is accessible** is displayed.
5	Select the **EjectMO** button.	The message **Media is outside** is displayed. Check that the media has actually been ejected.
6	Select the **LoadMO** button.	The message **Media is inside** is displayed. Check that the media is actually inside.
7	Select the **Format** button.	The message **Media in drive G was formatted successfully** is displayed.
8	Select the **GetVolInfo** button.	The message **Media in drive G has following properties: Media Label = MY_LABEL, Media File-System Name = FAT** is displayed.
9	Select the **Get BTPsector** button.	The message **The Bytes Per Sector value of media in drive G is 512** is displayed.
10	Select the **SetVolLabel1** button.	The message **Media Label set to TEST_LABEL1** is displayed.
11	Select the **GetVolInfo** button.	The message **Media in drive G has following properties: Media Label = TEST_LABEL, Media File-System Name = FAT** is displayed.
12	Select the **Exit** button and close the Diagnostic Application.	
13	Press the **Archive** button on the keyboard.	The *Patient List* window is displayed.
14	Press the **Utilities** button on the soft menu.	The *General Status* window is displayed.
15	Press the **Removable Media Utility** button.	The *Utility* window is displayed, showing the message: **Free space on Media: 1096 MB**.
16	Type the new label (for example, "Side1"), then select the **Format** button. Confirm "YES" to the warning message.	The message **Current Media Name is:SIDE1. Media was formatted successfully** is displayed. MO Label: SIDE1, MO STATUS: MOUNTED
17	Select the **Eject** button.	The message **Media Ejected** is displayed. MO STATUS: Ejected.
18	Select the **OK** button to exit the utility.	

4-3-4-3 CD Writer Test

Table 4-24 CD Writer Test

Step	Task	Expected Result(s)
1	Insert the new recordable CD X16 in the CDR drive.	
2	Press **Ctrl+F11** (or **Alt+D**) on the keyboard and select <Back End>, <Media Driver> and <CDR> as appropriate.	**UtilMO_CDR_App** is displayed.
3	Select the **IsMediaAcces** button and <**OK**>.	The message **Media in drive H is accessible** is displayed.
4	Select the **Eject** button. Respond <**No**> to the *Finalize Media? Yes/No* message.	The message **Media is outside** is displayed. Check that media has actually been ejected and select <**OK**>.
5	Press the **Load** button and respond <**OK**> to the message.	The message **Media is inside** is displayed. Check that media is really inside.
6	Press the **Format** button and respond <**OK**> to the message.	The message **Media in drive H was formatted successfully** is displayed.
7	Press the **GetVolInfo** button and respond <**OK**> to the message.	The message **Media in drive H has following properties: Media Label =** **Media File-System Name = CDUDF** is displayed.
8	Press the **Get BTPsector** button and respond <**OK**> to the message.	The message **The Bytes Per Sector value of Media in Drive H is 2048** is displayed.
9	Press the **SetVolLabel2** button and respond <**OK**> to the message.	The message **Media Label set to TEST_LABEL2** is displayed.
10	Press the **GetVolInfo** button and respond <**OK**> to the message.	The message **Media in drive H has following properties: Media Label = TEST_LABEL2** **Media File-System Name = CDUDF** is displayed.
11	Press the **FlushVol** button and respond <**OK**> to the message.	The message **The cached data is flushed to the volume in drive H** is displayed.
12	Press the **Exit** button and close the Diagnostic Application.	
13	Press the **Archive** button on the keyboard.	The *Patient List* window is displayed.
14	Press the **Utilities** button on the soft menu.	The *General Status* window is displayed.
15	Press the **Removable Media Utility** button and select MEDIA: CDRW.	The *Utility* window is displayed showing the message **Free space on Media: 665MB".** **MEDIA LABEL: TEST_LABEL2.** **Media status: MOUNTED**.
16	Press the **Eject** button and respond <No> to the **Do you want to Close Media for external use** message.	MEDIA STATUS: Ejected.
17	Press the **OK** button to exit the utility.	

4-3-4-4 Plug and Scan Test

Table 4-25 Plug and Scan Test

	Task	Expected Result(s)
1	Press the **On/Off** button on the control console for no more than 3 seconds.	The system enters *Standby* mode.
2	Turn OFF the system's circuit breaker.	The system remains in *Standby* mode, indicated by the blinking **On/Off** button LED.
3	Turn ON the system's circuit breaker. Press the **On/Off** Button.	The system returns quickly to the *Power-ON* state -less than 30 seconds.
4	Turn OFF the system's circuit breaker. Turn ON the system's circuit breaker after entering to Standby mode.	The system enters *Standby* mode and stays in this mode. The **On/Off** button LED is blinking.
5	Turn OFF the system's circuit breaker. Press the **On/Off** button.	The system enters the *Power-OFF* state. The **On/Off** button LED is OFF.

Section 4-4
System Turnover Checklist

Before returning the Vivid-i™ ultrasound scanner to regular operational use, the System Configuration settings should be checked. In 2D-Mode, press **Config** on the keyboard and check the settings in accordance with those listed or referenced in Table 4-26 below

4-4-1 Software Configuration Checks

Table 4-26 Software Configuration Checklist

Step	Task	Check
1	Check the date and time settings. Refer to Date and Time Adjustments on page 3 - 61.	
2	Check the language settings.Refer to Language Selection on page 3 - 62.	
3	Ensure that all of the software options are configured correctly. Refer to Software Options Configuration on page 3 - 73.	
4	Ensure that the hospital details are configured correctly. Refer to Table 3-22 on page 3-60.	
5	Ensure that the VCR is configured as required for the specific site and country. Refer to video converter setup - see Figure 3-34 on page 3-42.	
6	Ensure that the measurement units are configured as required for the specific site and country.Refer to Units of Measure on page 3 - 63.	
7	Ensure that the connectivity network settings have not been modified and are configured as required for the specific site. Refer to Set the Scanner's Network Information on page 3 - 83.	

Section 4-5
Site Log

Table 4-1: Vivid-i™ Site Log

Date	Service Person	Problem	Comments

Table 4-1: Vivid-i™ Site Log (Continued)

Date	Service Person	Problem	Comments

Chapter 5
Components and Function (Theory)

Section 5-1
Overview

5-1-1 Purpose of Chapter 5

This chapter contains block diagrams and functional explanations of the Vivid-i™ portable ultrasound system and its components.

Table 5-1 Contents in Chapter 5

Section	Description	Page Number
5-1	Overview	5-1
5-2	General Information	5-2
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5-4	Front End	5-5
5-5	Back End Processor	5-49
5-6	Power Supply Unit	5-74
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Section 5-2
General Information

The Vivid-i™ is a compact, fully portable, phased, linear array ultrasound imaging scanner. Weighing only 5 Kgs (11 lbs), this laptop-style system is extremely versatile and, depending upon the installed software, can be used for various applications, such as:

- 2D Grey Scale and 2D Color Flow Imaging
- M-Mode Grey Scale Imaging
- Color M-Mode
- Doppler
- A number of combinations of the above

Vivid-i™ technology includes advanced power management based on SMBus and ACPI. The various power options include:

- Rechargeable Battery (internal/external)
- AC/DC Power Supply (auto-sensing)
- Docking Unit (for future use)

The system is equipped with a highly efficient power supply, resulting in low power consumption and minimal acoustical noise.

Among other significant features of the Vivid-i™ portable ultrasound scanner are the following:

- Integrated, low-power Front End (uses advanced ASIC and FGPA technologies).
- Open connectivity using dual PCMCIA interface and USB
- Blue Tooth - wireless connectivity
- Low power (less than 8W), high performance 15" LCD monitor (with fully adjustable contrast and viewing angle)
- Low profile, backlit Keyboard

In addition, the Vivid-i™ enables acquisition of the following signals: ECG, and external ECG. By changing the position of electrodes, the module supports acquisition of three bipolar ECG channels: leads I, II, III.

A Physio module is incorporated in the Keyboard to provide ECG signals to synchronize cardiac ultrasound image acquisition. Additionally, other analog inputs (from devices such as treadmills) are processed.

Vivid-i™ has a digital beam forming system (incorporated in the Front End) which can handle up to 192 element linear probes by use of multiplexing.

Signal flow travels from the Probe Connector Panel, to the Front End (FE) Electronics, to the Back End Processor (BEP), and finally is displayed on the monitor and peripherals.

System configuration is stored on a hard disk Hasp plug and all necessary software is loaded from the hard disk on power-up. The user initiates system operation via the keyboard.

Vivid-i™ internal electronics are divided into three:

- Front End (FE) Processor.
- Back End Processor (BEP).
- Power Supply Unit.

Interconnecting signals from the FE, BEP, keyboard, monitor, and power distribution sub-systems are routed internally.

The main functional blocks in the Vivid-i™ system are listed below, and described in detail in this chapter, as follows:

- Front End (FE) Processor - see Front End on page 5 - 5
- Back End Processor (BEP) - see Back End Processor on page 5 - 49
- Keyboard and ECG - see Keyboard and Control Panel on page 5 - 84
- Battery and Mains Power Charger - see Power Supply Unit on page 5 - 74
- Peripherals - see Peripherals on page 5 - 92

For a detailed block diagram of the Vivid-i™ system, refer to Figure 5-1 on page 5-4.

Section 5-3
System Block Diagrams

5-3-1 System Block Diagram

Figure 5-1 below shows a System Block Diagram.

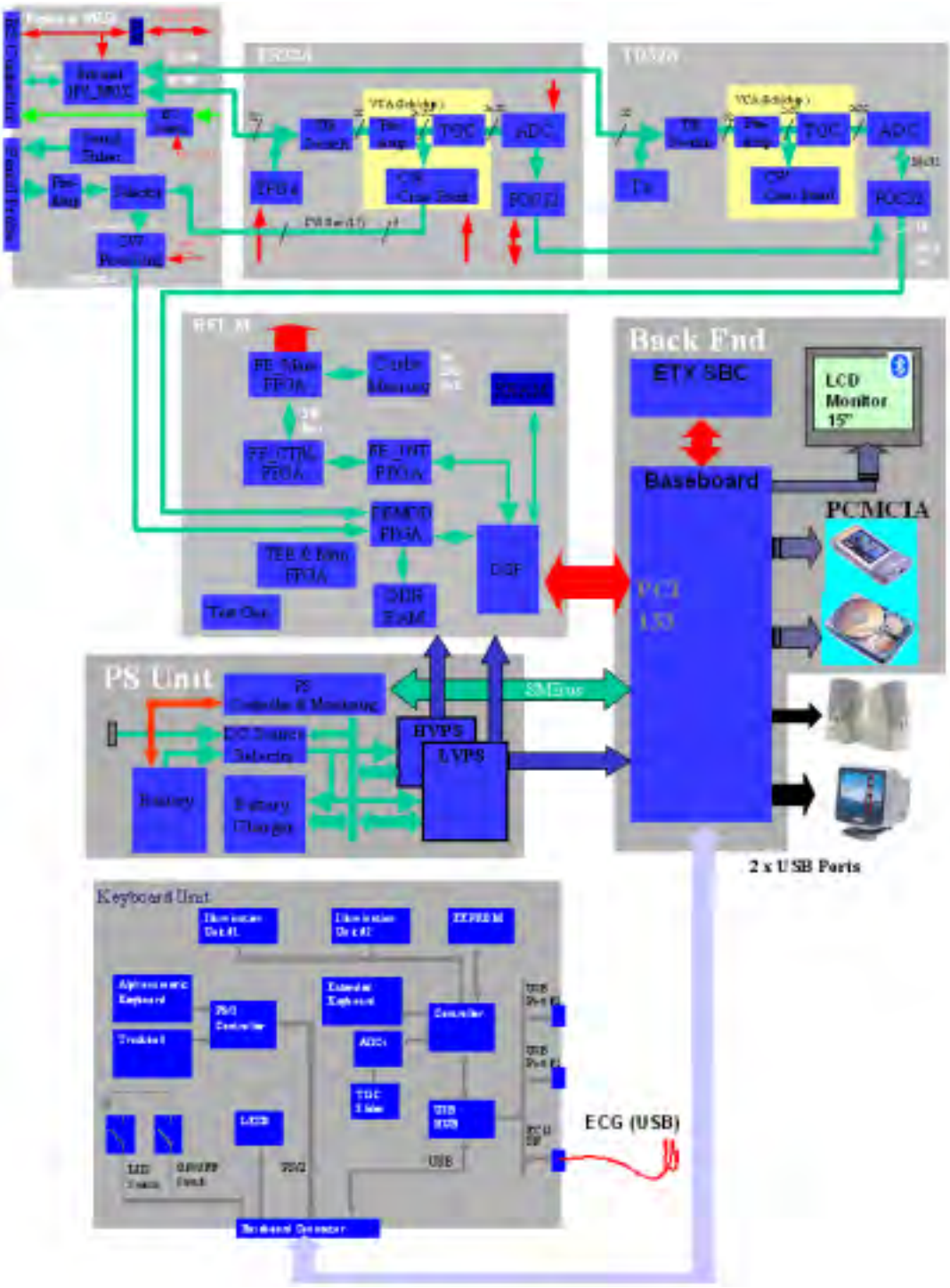


Figure 5-1 Vivid-i™ System Block Diagram

Section 5-4
Front End

5-4-1 General Information

The Vivid-i™ Front End (see diagram in Figure 5-2 below) is made up of the following components:

- **Radio Frequency Interface (RFI) Board** - combines the following sub-boards and functionalities: FEC (Front End Controller), RFT (Radio Frequency & Tissue) processor, and IMP (Image Port). The functions of these components are described in Radio Frequency Interface (RFI) Board on page 5 - 10.
- **TR32 Boards** - comprise two identical TR 32 Front Boards (TR32A and TR32B). Each TR 32 board has 32 channels (total 64 channels) and also includes a 32 channel digital Beamformer. For a detailed description, see TR32 Boards (Front Boards) on page 5 - 33.
- **Probe and MUX Board** - enables acquisition and processing of signals from and to probes connected to the front panel, including a special CW circuit. For a detailed description, see Probe and MUX Board on page 5 - 41

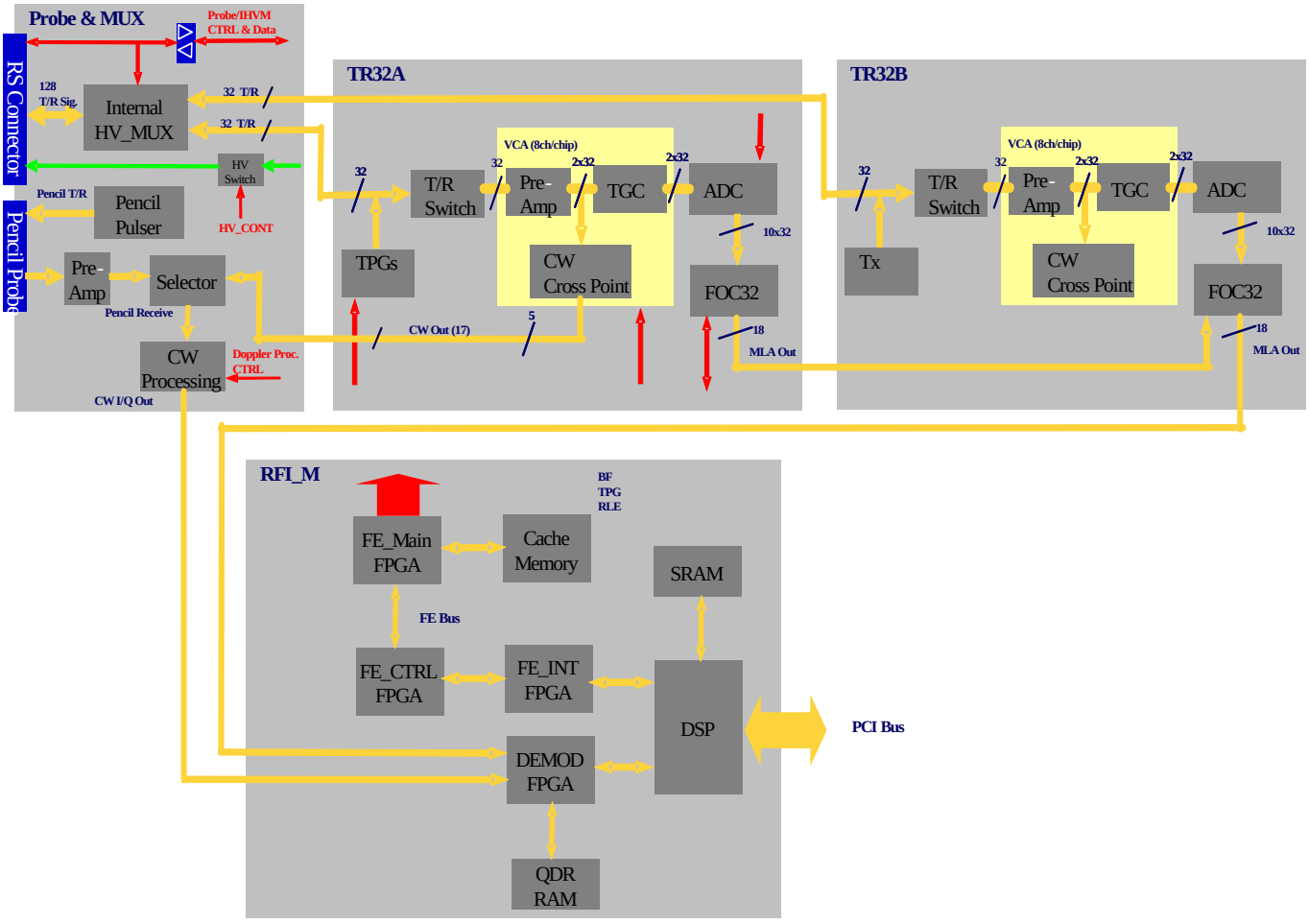


Figure 5-2 Front End Block Diagram

The Front End can be divided into two subsystems, as follows:

1.) **Front End subsystem**
which includes:
- TR32 Boards (includes a 32-channel digital Beamformer)
- Probe & MUX Board (includes HVMUX and CW Analog A/D)

2.) **Mid Processors subsystem**
which includes:
- RFI (Radio Frequency and tissue processing board)

5-4-1-1 Front End Bus

Most of the FE boards are controlled by the RFI board via a Front End Bus (FE_BUS). The FE_BUS is a synchronous and bidirectional bus built up of16-bit data, 6-bit device address select, 10-bit page address and 8 strobe signals controlling the data transactions. The RFI board can also read the revision status of the Front End boards through a serial line I^2C to an E^2PROM located on each board, and some probes.

5-4-1-2 Phased and Linear Array Front End

- The phased and linear array probes consist of several identical transducer elements (for example, 64, 128, 192). One probe and a pencil probe can be connected to the system. The connectors are physically located on the Probe and Mux board, where one of them is selected and connected to the transmitter (TX) and receiver (RX) through a number of relays.
- Depending on probe type and system setup, a certain scan pattern is selected on the RFI board. This board loads scan parameters for both the transmitter and the beamformer (steering and focusing delays) into local RAM on these boards. Thus, when the RFI board goes through a scan sequence, it loads the proper contents of the RAM into the Transmitter Pulse Generator (TPG), then issues a transmit trigger pulse (TXTRIG_L) for the transmitter and a receive synchronization pulse (SYNC_L) for the beamformer. By firing the transmit pulses from the different elements at certain repeated time intervals and with different delays, the ultrasound beam can be steered in desired directions (re. principles of operation) obtaining the selected scan patterns (for example, 2D, 2D Flow, etc.).
- The ultrasound transmit bursts are generated on the TR32 boards, initiated by the transmit trigger pulse (TXTRIG_L). The transmit trigger starts the Transmit Pulse Generators (TPG) on the TR32 board, each generating 16 transmit pulses with different delays. The transmit pulses are then routed to separate transmit “amplifiers” fed with voltage HV witch are controlled by the Acoustic Power control software on the Probe and MUX board.
- The transmit pulses are routed over HVMUX Located on the Probe and MUX board, where they are fed to the selected phased/linear array probe.
- The reflected signal from body structures and blood cells are routed from the probe, via the MUX board over to the TR32 boards, where pre amplification (20dB) and Analog Time Gain Compensation (ATGC) (-10 - +30 dB) is performed. Gain is determined by an analog signal (ATGC) generated by the RFI board.
  At the input to the TR32 boards are transmit/receive (T/R) switches to prevent the transmitters from destroying the receivers. Prior to pre amplification, the signals from the different channels were also fed through relays. This provides the possibility to route echoes from annular array probes into the receiver, in addition to injecting a test signal, TSIG.
- The output channels from the TR32 boards are fed to the 10 bit, 32 Channel Beamformer. The Beamformer performs A/D conversion of 32 channels, which are later transferred and summed in the FOC into MLA0 and MLA1.

- The RFI board controls all Front End boards. The board loads all parameters to the TR32, MUX and Beamformer RAMs, reads the probe identification, selects the probe connector on the MUX board and controls the high voltage multiplexer in linear probes. In addition, the board generates the following:
    * a transmit trigger pulse for TR32.
    * a receive synchronization pulse (SYNC_L) used by Beamformers.
    * a differential ATGC voltage used by TR32 and control signals for the High Voltage Power Supply (HVPS).
    * the global system clock (40 MHz).
    * a reset pulse (SRES).
- The output from the Beamadders at BF is fed to the RF and Tissue Processor Board (RFI).

5-4-1-3 Transmitter Power Supply (HVPS)

The transmitters on the TR32 boards are fed with high voltage from the TX supply. This module consists of two linear power supplies: one providing a symmetrical output voltage ranging from 2 to +/- 70 V (THV), and another providing a voltage outputting +/- 80 V for the multiplexers in the linear probes (SHV). THV and SHV is are programmable through a serial interface (SMBUS) from the Base board (Back End).

5-4-1-4 Mid Processors

The Vivid-i™ Front End and visualization system are interconnected through digital signal processing modules, called the Mid Processors. These processors perform the adequate signal conditioning for the different data types; *Tissue*, *Doppler* and *Flow*.

5-4-1-5 Transmit Signal Path

The transmit signal is configured via the operating mode that was selected by the user. When this mode is selected, it sets those operating parameters for the RFI, and the Base board sends a signal to the high voltage power supply (HVPS) to program the supplies.

Once the signal is transmitted, it is received by the transmit pulsor (HVMUX) which is a switching device that will propagate the signal between different elements of the probe. The propagation of that signal depends on the way in which the RFI programs the MUX board RAM table.

The signal from the HVPS comes in to the TPG; the TPG then generates a signal to the probe (connected to the MUX), in accordance with a command generated in Timing Pulse Generator (TPG). The TPG operates according to tables in the RAM table - see Figure 5-3 on page 5-8.

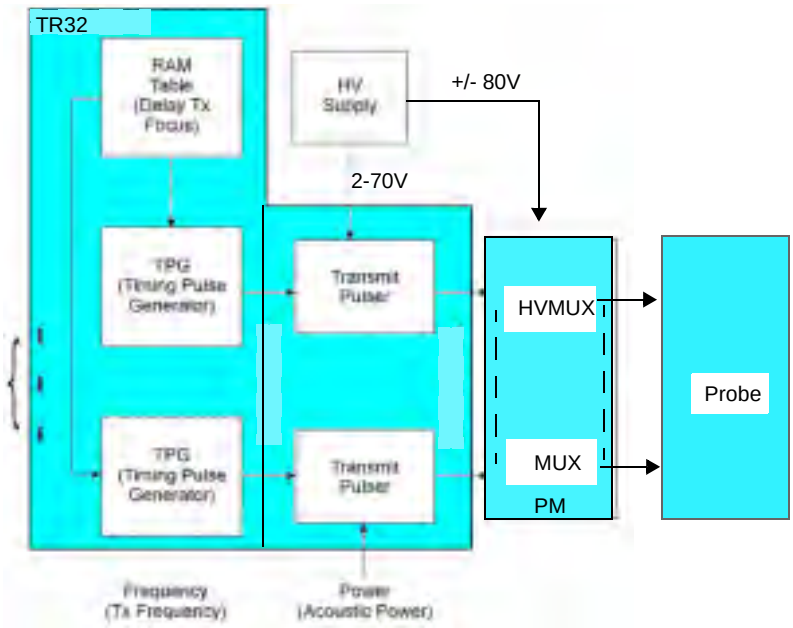


Figure 5-3 Transmit Signal Path Block Diagram

5-4-1-6 Received Signal Path

The receive signal is programmed according to the operating mode that was selected by the user. In some cases the signal is received immediately after it has been transmitted, sometimes after a prescribed delay, and in other cases at the same time as transmission (transmit/receive simultaneously).
Refer to Figure 5-4 on page 5-9.

The probe elements receive the echo signals from different depths. These signals are amplified and conditioned at the Analog Time Gain Compensation (ATGC) control. The different operating modes dictate in which way the signals are translated, as follows:

- *Continuous Mode (CW)* - echo signals are transmitted and received simultaneously, and translated per echo point for a specified depth. This provides a real-time image.
- *2D Mode* - signals are received from all 64 channels (if a probe has more than 64 elements, the MUX is used to create the additional missing channels). The signals are transmitted at a prescribed delay between the elements, and immediately after this are received (all the time, aiming at one point at a specific depth). In this way, echo signals are collected from all points along a certain line, from which a vector is created. The vector is transmitted from the MUX board, and from there to the Beamformer where it is amplified and undergoes analog-to-digital conversion. From here MLA0, and MLA1 signals are transmitted to the RFI board, where an image is created.
- *Color Flow Mode (CFM)* - shows the movement of particles (this mode is usually used together with 2D mode). In CFM mode, the echo signal received is used to measure the amount of frequency phase change (degree of shift) - this is referred to as the *Doppler effec*t. When using CFM and 2D modes together, at the same time that the signal is received, in parallel it is used to generate a signal through a circuit that translates the Doppler effect, and from which it generates a color image.

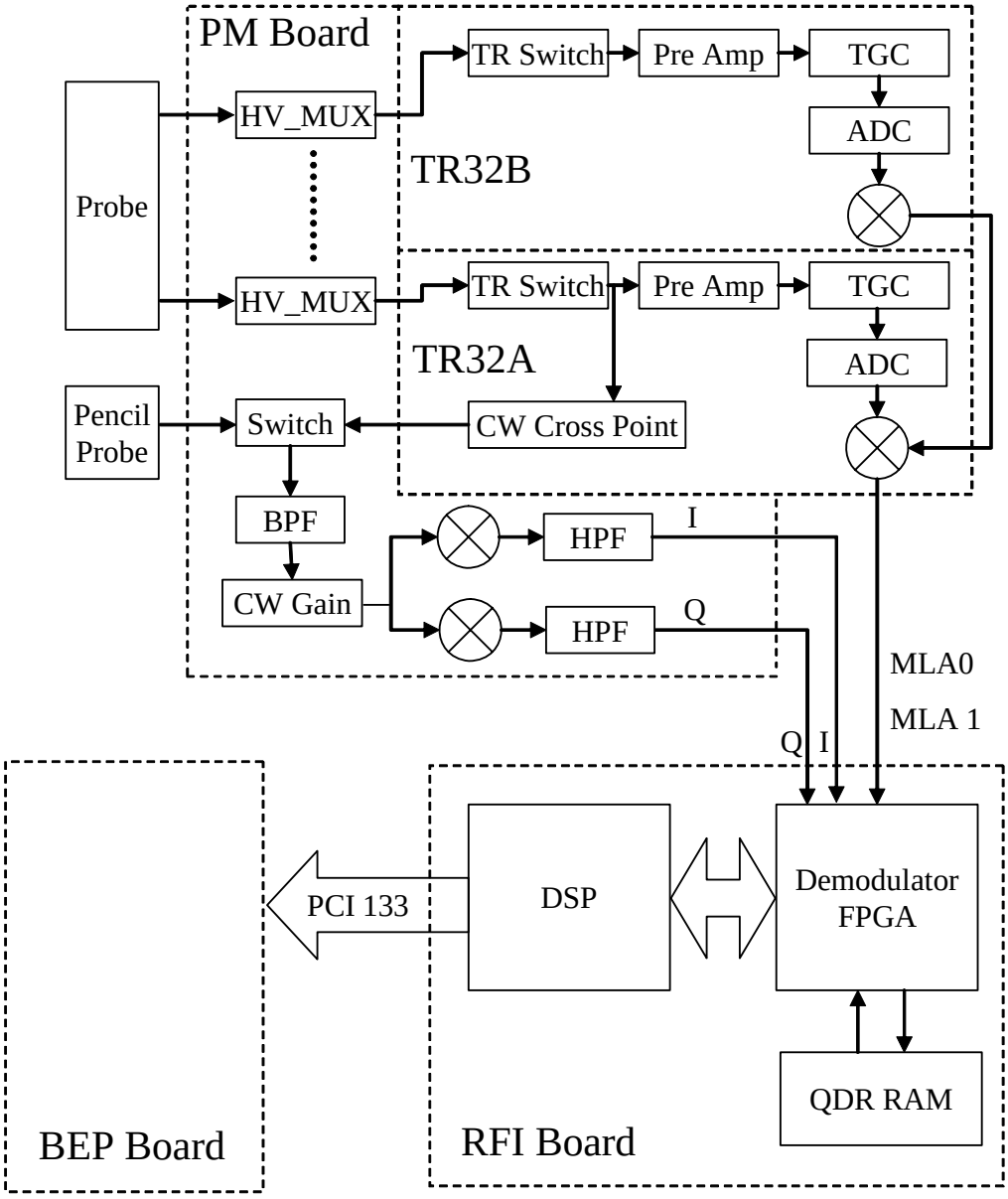


Figure 5-4 Received Signal Path Block Diagram

5-4-2 Radio Frequency Interface (RFI) Board

5-4-2-1 General Description

The RFI Board (see Figure 5-5 on page 5-11) is the Front End component responsible for controlling the following major system functions:

- RF data processing
- Sequence control
- Monitoring
- Downloading of scan parameters
- Power Management capabilities

NOTE: The functionality of the RFI board on the Vivid-i™ system replaces that of the three main boards currently found on earlier models of the Vivid™ system (namely, the RFT, FEC and Image Port boards).

For reference, a list of abbreviations used in this section is provided in Table 5-2 below.

Table 5-2 Abbreviations and Definitions

Abbreviation	Definition
ADC	Analog-to-Digital Converter
ATGC	Analog Time Gain Compensation
BF	Beam Former
DSP	The Texas Instrument DSP, TMS320C6415 located on the RFI board
EMIFA	64 bit external memory interface port on the DSP
EMIFB	16 bit external memory interface port on the DSP
FEbus	Front End bus
FEBUS	Front End Bus
FOC	Focusor [Component]
MLA	Multi Line Acquisition
QDR-SRAM	Quad Data Rate Static Random Access Memory
RegFile	Internal register file in the DEMOD FPGA, controlling the function of the FPGA
RFI	Radio Frequency Interface (includes RFT, FEC & Image Port boards).
RLE	Run length encoding (Transmitter board)
RX	Receiver
SDRAM	Synchronous DRAM
TPG	TX Pulse Generator [ASIC Component]
TX	Transmitter
RFT	RF & Tissue processing
FEC	Front-End Controller
FPGA	Field Programmable Gate Array

The RFI board utilizes the most advanced DSP and FPGA technologies currently available. Based on the TMS320C6415 DSP, the design incorporates a PCI interface and two memory ports (EMIFA and EMIFB). The DSP, EMIFs, and PCI bus operate at 600MHz, 133MHz, and 33MHz, respectively.

The RFI Board (see Figure 5-5 below) combines the following sub-boards and functionalities: FEC (Front End Controller), RFT (Radio Frequency & Tissue) processor, and IMP (Image Port). These functions are described later in this section.

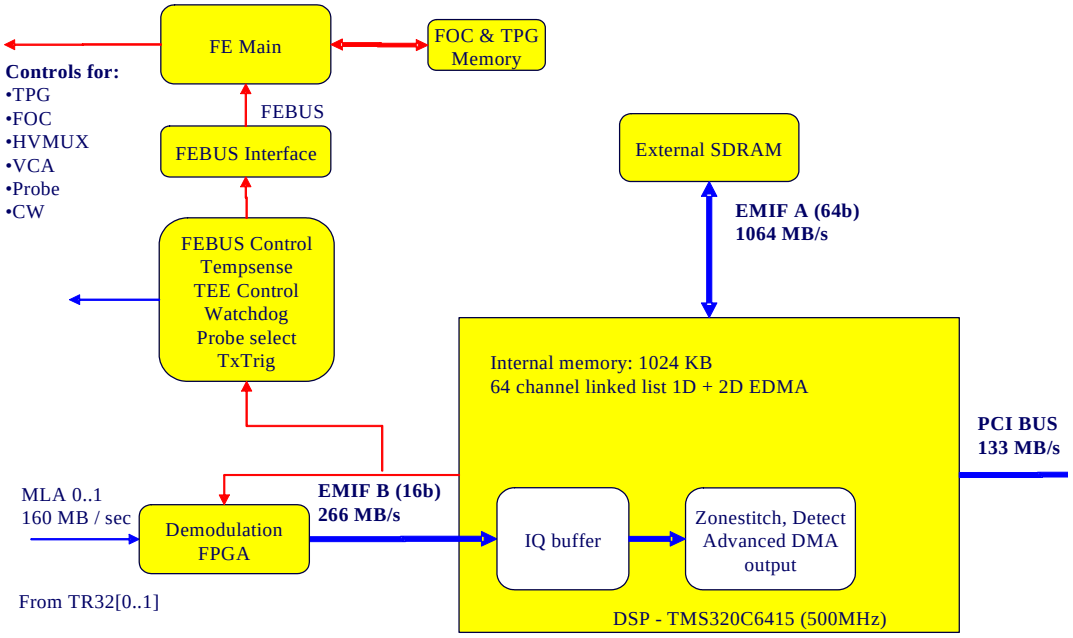


Figure 5-5 RFI Board Block Diagram

5-4-2-1-1 Tasks Performed by the RFI Board

The following lists the main tasks performed by the RFI Board:

- System Master Clock generator
- Transmitter Control
- ATGC Control
- Receive Focusing Control
- Analog Test Signal Generator
- High Voltage Control and supervision
- Probe Sensing
- Control of MUX board and TR32 boards
- Temperature Sensing for TEE probes
- Step Motor Control for TEE probes

5-4-2-1-2 Signal Flow

The digitized signals from the Beam Formers are connected to the RFI module. The Digital Signal Processor on the RFI board, together with software on the BEP, performs the adequate signal conditioning for the different data types; *Tissue*, *Doppler* and *Color Flow*.

In addition, Doppler Audio Processing is performed by the RFI board. (The Doppler Spectrum Processing is done by the BEP). For details, see Doppler Audio Path on page 5 - 22.

The RFI extracts Tissue Data, Spectrum Data and IQ & Color Data from the digital data stream on its input, and it also performs RF filtering and different types of Tissue Processing.

5-4-2-1-3 RF Processing

Different types of RF processing is performed, depending on later usage of the data. This includes:

- RF Demodulation
- Digital Time Gain Compensation
- Filtering
- Decimation

5-4-2-1-4 Data Buffer

After RF filtering, the data is written into different sliding ring buffers, dedicated to the different types of data. While data is written into the buffers sample-by-sample in vectors, multiple samples from the same range (depth) can be read out.

Both input addressing (start and length) and output addressing (through output events) are controlled by the RFI board itself.

5-4-2-1-5 Tissue Processing

A number of different tissue processes are performed on the RFI board:

1.) Firstly, the signal amplitude is obtained by *detection*.

2.) Then the data is compressed to attenuate the strong signals and amplify the low level echoes.

3.) After compression, *Zone Stitching* is performed. Zone Stitching is used to combine the (transmit) focal zones from different vectors into one vector by weighting the zone transitions, and only applies to phased/linear array probes where multiple vectors can be collected in the same direction. For M-Mode, *peak detection* and *edge enhancement* is implemented.

4.) Finally, an offset is added to the signal and clipping is performed.

5-4-2-1-6 Color Flow Processing

No Color Flow processing is performed here, except for the RF demodulation previously mentioned. The data used for Color Flow is tagged with the appropriate headers and tails and sent to the Back-End Processor (BEP).

5-4-2-1-7 Doppler Data

On the RFI board, Doppler Data is high pass filtered (to remove strong low frequencies returned from wall motion, valves and leaflets) and then sent to the BEP, and to Audio Circuitry on the KB Control Board.

5-4-2-1-8 System Temperature Surveillance

The RFI board monitors the temperature in the airflow at the air intake, and in the airflow at the air outlet.

These measurements make it possible to monitor the environmental conditions (temperatures) for the scanner and prevents overheating.

5-4-2-1-9 Probe Management

The RFI board performs the following probe management functions:

- Controls the selection of a probe connector
- Senses the Probe *type*
- Senses the Scan Plane Angle on MPTE and PAMPTE probes
- Senses the Probe *temperature*
- Turns OFF the probe if the temperature exceeds the *maximum* temperature.
  The temperature references are set to 41.3 ^{o}C and 43.0 ^{o}C.
- Turns OFF the probe if the temperature reading falls below *minimum* temperature
  The minimum temperature references is set to15 ^{o}C. A temperature reading as low as 15 ^{o}C indicates a probe temperature-sensing error.

Figure 5-6 below shows a diagram illustrating the PCI I/F, DEMODE FPGA & FE CONTROL & FE I/F FPGAs. Figure 5-7 on page 5-14 shows a diagram of the FE_MAIN FPGA (this provides the interface specific for the Vivid-i™ Front End).

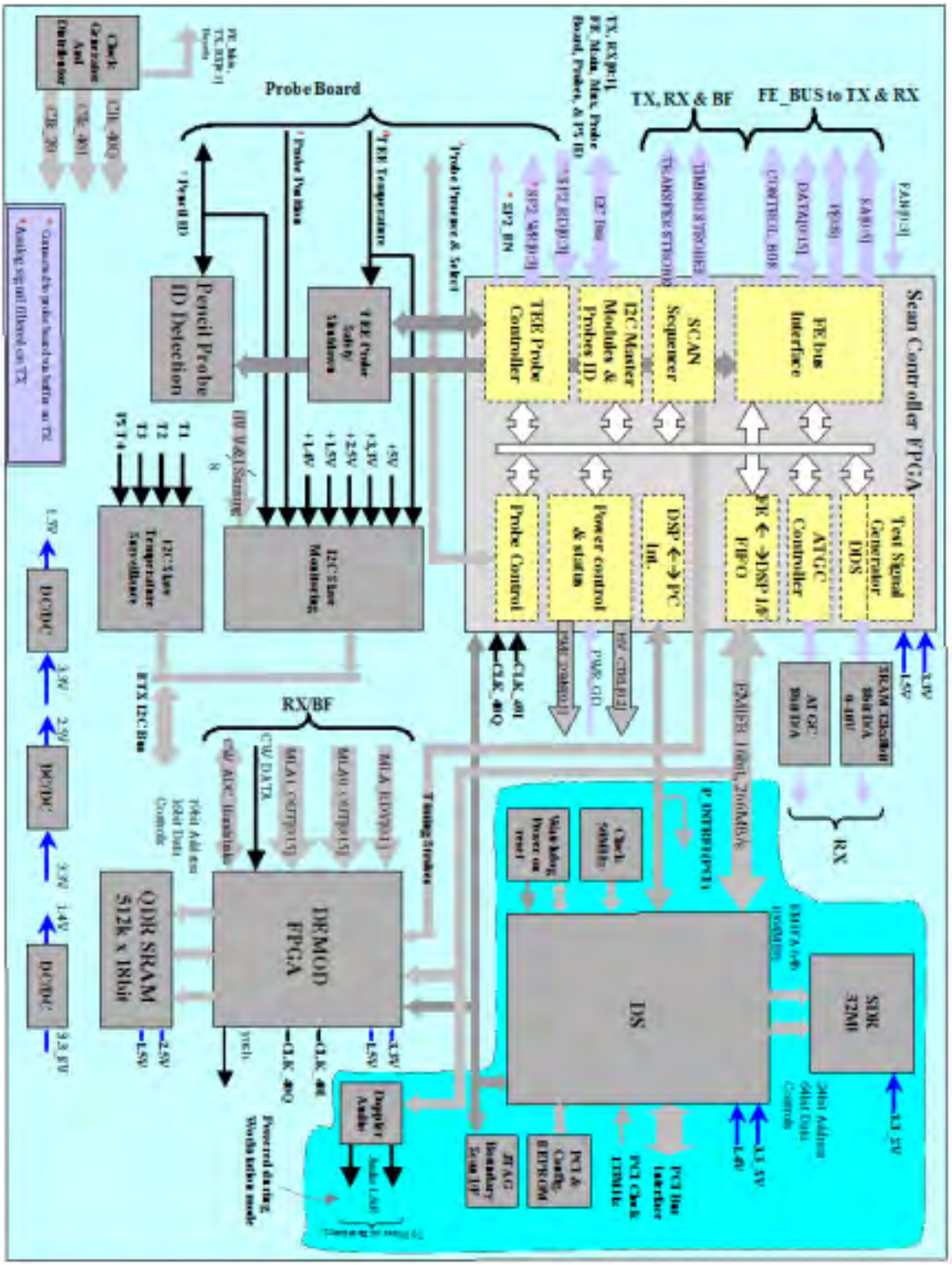


Figure 5-6 Detailed RFI Block Diagram

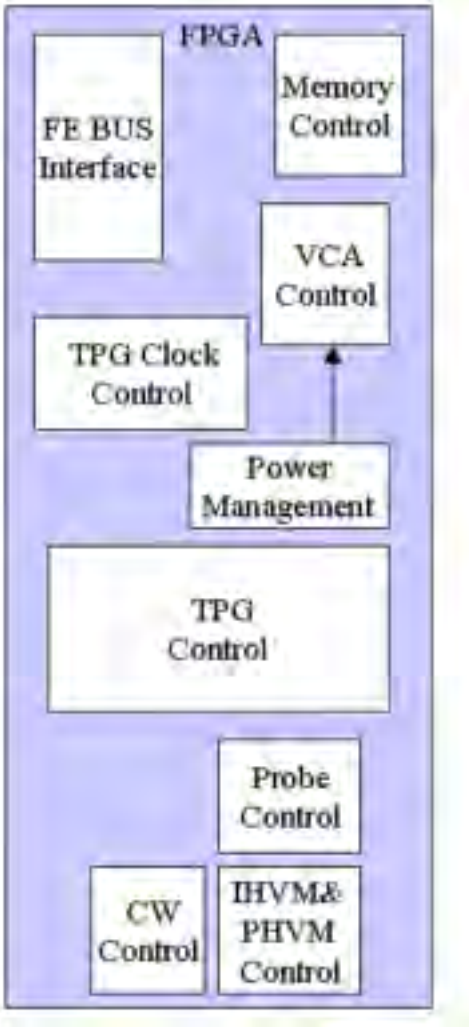


Figure 5-7 FE_Main FPGA Block Diagram

5-4-2-2 DSP

The DSP controls all the FPGAs and all other onboard logic. All data is moved through the DSP, which is possible since the DSP supports high bandwidth data transfer, and has a built-in PCI and two memory ports. In addition, an advanced DMA controller is built into the DSP.

Tasks performed and/or controlled by the DSP include the following:

- Scan instruction program decoding and set-up.
- Reading data from the demodulator
- Organizing data prior to transfer to the Host
- Detection, filtering and other processing
- Communication with the Host
- Firmware download to all FPGAs
- Doppler audio processing and syntactic pulse repetition frequency (PRF) generation

The DSP is able to access all FPGAs mounted on the RFI board, using EMIFB.

The DSP does not have a boot PROM, but boots from the PCI. The PCI host downloads data into the SDRAM and then sends an interrupt to the DSP.

The DSP generates syntactic PRF when cine playback is required (up to 30KHz; when above 30KHz, a decimation of 2:1 is used).

For Doppler audio, both Hilbert transform and audio gain is implemented by the DSP local SW.

5-4-2-2-1 PCI Connection

The RFI-M board interfaces directly to the PCI bus via the DSP PCI to the local bus bridge. The PCI connection complies with the following:

- The PCI termination scheme resistors complies with PCI specifications version 2.2.

5-4-2-2-2 Watchdog and Power ON Reset

The DSP requires reset while the power supply is settling, and for a period of time thereafter.

In addition, for safety reasons, a HW watchdog stops ultrasound transmit and resets the DSP if the DSP stops toggling the watchdog inputs. In the event that the DSP stops toggling the watchdog inputs, the watchdog stops the ultrasound transmit and resets the DSP. The watchdog incorporates the following features:

- The watchdog is enabled by the DSP before it is activated.
- When activated, the watchdog input toggles approximately once / second. If toggling fails, the DSP is reset and ultrasound transmit is stopped.

Once enabled, it is not possible to disable the watchdog unless the board is reset, or power is cycled.

5-4-2-2-3 SDRAM

The SDRAM is connected directly to the DSP EMIFA bus.

Note: There are no other components connected to the signals used by the SDRAM. (The proximity to the DSP makes it impossible to use termination resistors).

The SDRAM is 64 bits wide. Initially, the total SDRAM size is set to 32 Megabytes.

Capacitive load on signals is kept to a minimum, as is the board area.

The SDRAM is capable of operating at 133MHz.

The SDRAM subsystem supports little endian accesses.

5-4-2-2-4 PCI and Configuration EEPROM

The RFI uses PCI EEPROM auto-initialization. The PROM size is 4Kbit organized at 256 x 16 and the PCI-contents of the PROM are predefined. The EEPROM (which contains information about the *hardware version*, *production date*, *etc*.) autoloads the Front End default operation values during boot-up, which later will be used to operate the Front End, using the RFI board.

5-4-2-2-5 DSP Host Communication

Special hardware supports efficient communication between the DSP and the Host. The DSP has a limitation in the handling of interrupts (MASTEROK and HOSTSW is shared into the DSPINT interrupt) that makes it necessary to dedicate DSPINT to MASTEROK (PCI DMA master finished interrupt). Therefore, Host ? DSP interrupts have been implemented using a different mechanism, as follows:

- Special hardware supports generating PCI interrupts from the DSP to the Host.
- There is a "FIFO" of interrupts in order to reduce absolute interrupt response requirements on the Host side.

There are several different types of data and message flow in the system. The major ones are outlined below:

- DSP ? Host messages (with or without reply)
- Host ? DSP messages (with or without reply)
- DSP ? Host DMA transfers (typical data traffic)
- Host ? DSP DMA transfers (setup, instruction program. *etc.*)
- Host ? FEBUS DMA transfers (see Figure 5-8 on page 5-17)
- FEBUS? Host DMA transfers (see Figure 5-9 on page 5-18)

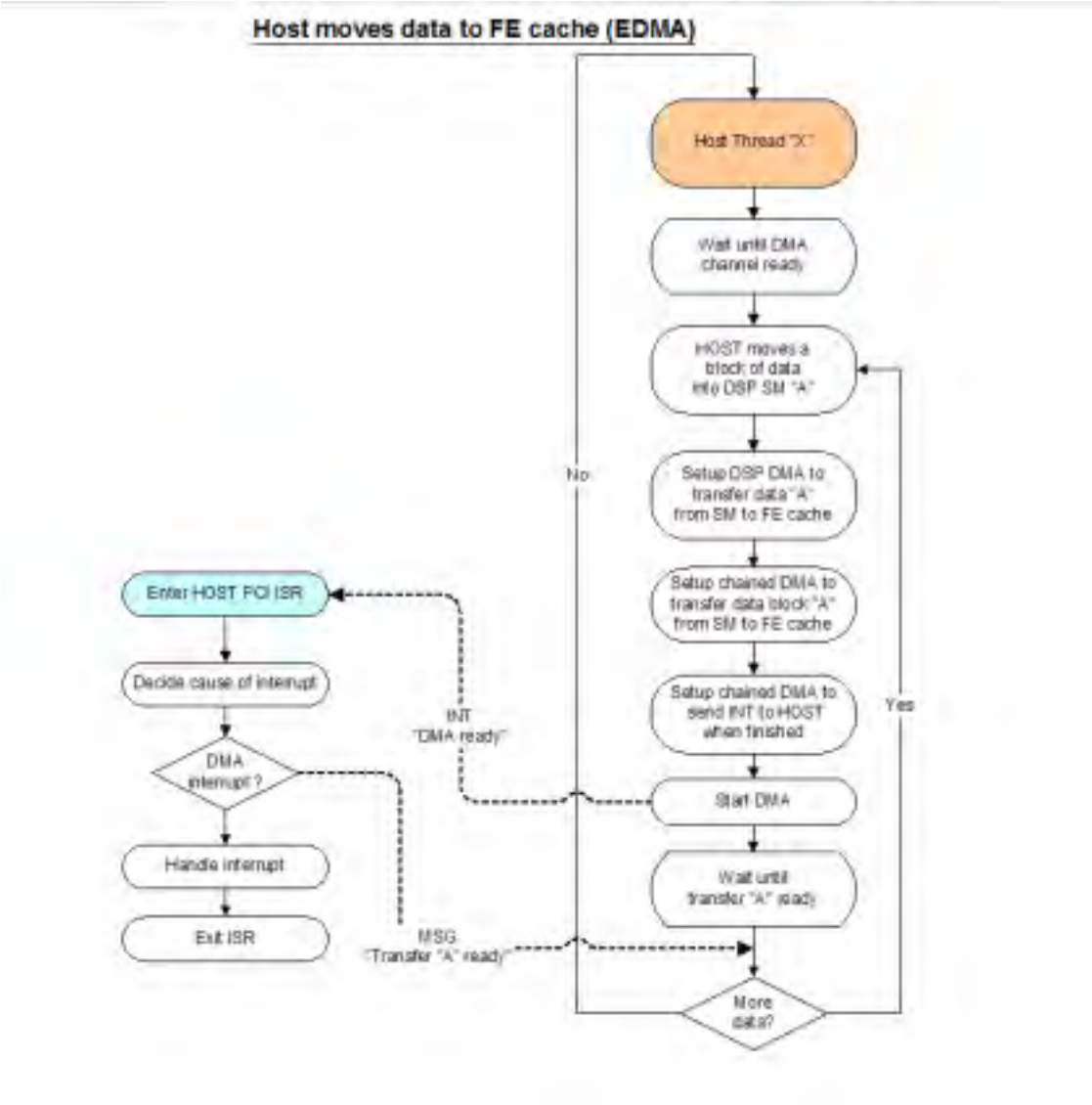

Host moves data to FE cache (EDMA)
Host Thread "X"
Wait until DMA channel ready
HOST moves a block of data into DSP SM "A"
Setup DSP DMA to transfer data "A" from SM to FE cache
Setup chained DMA to transfer data block "A" from SM to FE cache
Setup chained DMA to send INT to HOST when finished
Start DMA
Wait until transfer "A" read)
More data?
No
Yes
Enter HOST PCI ISR
Decide cause of interrupt
DMA interrupt ?
Handle interrupt
Exit ISR
INT "DMA ready"
MSG "Transfer "A" read)"

Figure 5-8 Host to FEBUS DMA Transfers

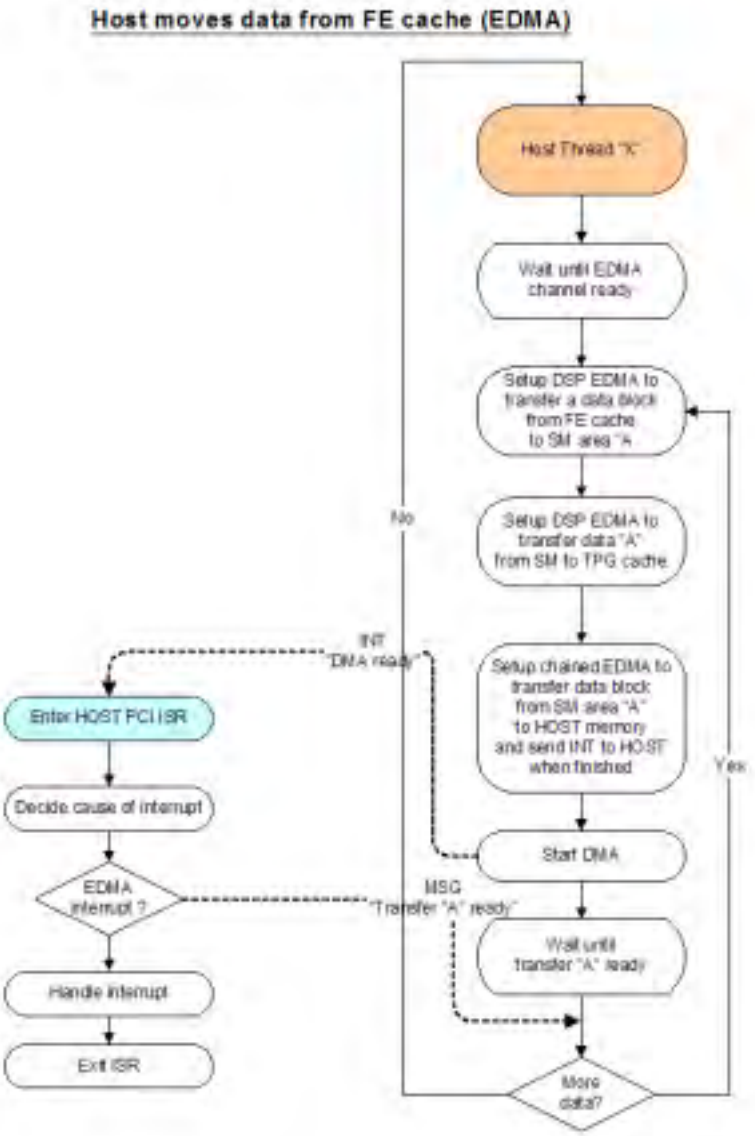

Host moves data from FE cache (EDMA)
Host Thread "K"
Wait until EDMA channel ready
Setup DSP EDMA to transfer a data block from FE cache to SM area "A"
Setup DSP EDMA to transfer data "A" from SM to TPG cache
Setup chained EDMA to transfer data block from SM area "A" to HOST memory and send INT to HOST when finished
Start DMA
Wait until transfer "A" ready
More data?
No
Yes
INT "DMA ready"
Enter HOST PCI ISR
Decide cause of interrupt
EDMA interrupt ?
MSG "Transfer "A" ready"
Handle interrupt
Exit ISR

Figure 5-9 FEBUS to Host DMA Transfers

All communication is achieved using the DSP shared memory area. No additional hardware support is required other than that described in this section.

In order to achieve maximum PCI efficiency, data is always *pushed* over the PCI bus. This means that transferring large amounts of data DSP ?Host is done using the DSP DMA controller. Likewise, transferring large amounts of data Host ? DSP is done using the Host DMA controller.

5-4-2-2-6 FPGA Configuration

FPGA configuration is done using one of the DSPs serial ports, and features the following:

- The FPGAs are configured serially.
- There is maximum usage of the serial port inherent design (I^2C).

5-4-2-2-7 DMA Transfers Controlled by the Host

The host can initiate DMA transfers internally on the DSP by accessing different EDMA channels. It can also initiate PCI master accesses by writing to the following registers (either directly or by using DMA):

- DSPMA (DSP master address register)
- PCIMA (PCI master address register)
- PCIMC (PCI master control register)

5-4-2-2-8 "Demod" DMA Transfers Controlled by the DSP

To constantly ensure efficient data transfer, a highly efficient interface has been used. This is a synchronous FIFO capable of operating at the maximum bus clock frequency (currently 133 MHz).

The demodulation FPGA has two internal FIFOs, one for reading data and one for writing data. The sizes of these FIFO are predefined (typically 1024 words deep).

During data acquisition, the data FIFO is filled continuously. In order to avoid FIFO overflow, the following scheme has been implemented:

- When, say, 900 words have been written to the FIFO, the FPGA sends a "data ready" event to the DSP.
- This event triggers the DMA controller to read 900 words of data.
  Only 900 words are used instead of 1024 to avoid FIFO overflow
- When another 900 words have been written, another event is sent.
- … and so on…
- Finally, when the last *n* words have been written, the last event is sent.
- This event triggers the DMA controller to read *n* words of data and then issue a CPU interrupt that signals that all data for this vector have been received.

5-4-2-2-9 "FEBUS" DMA Transfers Controlled by the DSP

The FEBUS is fully memory mapped, thus DMA transfer will be automatically handled by the DSP once the memory interface has been properly programmed.

5-4-2-2-10 Normal Beam Subframes

The time frame for each beam is divided into two subframes: data acquisition frame (data_acq) and parameter update frame (param_upd). The PRT is the sum of the two subframes.

Three timing strobes, SYNC_L, TX_TRIG_L and EOLN_L are generated per beam:

- Assertion of SYNC_L indicates the start of data acquisition for a new beam
- Assertion of TX_TRIG_L initiates the transmit pulses.
- Assertion of EOLN_L indicates the termination of data acquisition for a beam. The DEMOD FPGA generates this signal as an interrupt to the DSP. This is necessary in order for the DSP to efficiently identify the start of the parameter update period. This line is also connected to the FEBus Scan Sequencer to indicate that a new PARAM_UPD is initialized immediately (ensures proper settling time before next line).

PARAM_UPD is defined as the period from the assertion of EOLN to the assertion of the next SYNC.

The assertion of EOLN_L indicates the termination of data acquisition for a beam and DATA_ACQ is defined as: the period from the assertion of SYNC to the assertion of the next EOLN_L.

Periods of the scan sequencer with synchronization signals and BF strobes (during a normal scan) are illustrated in Figure 5-10 below.

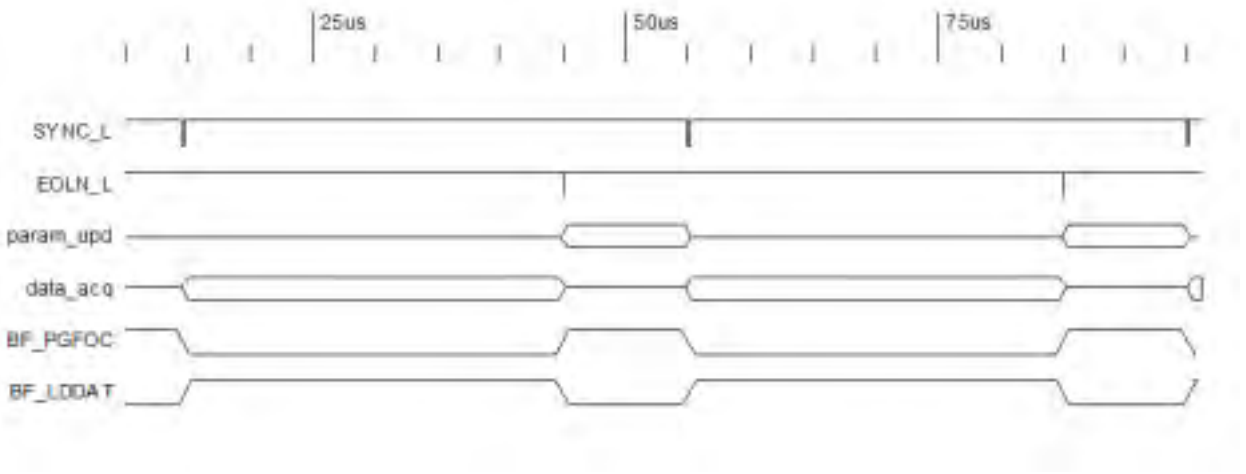
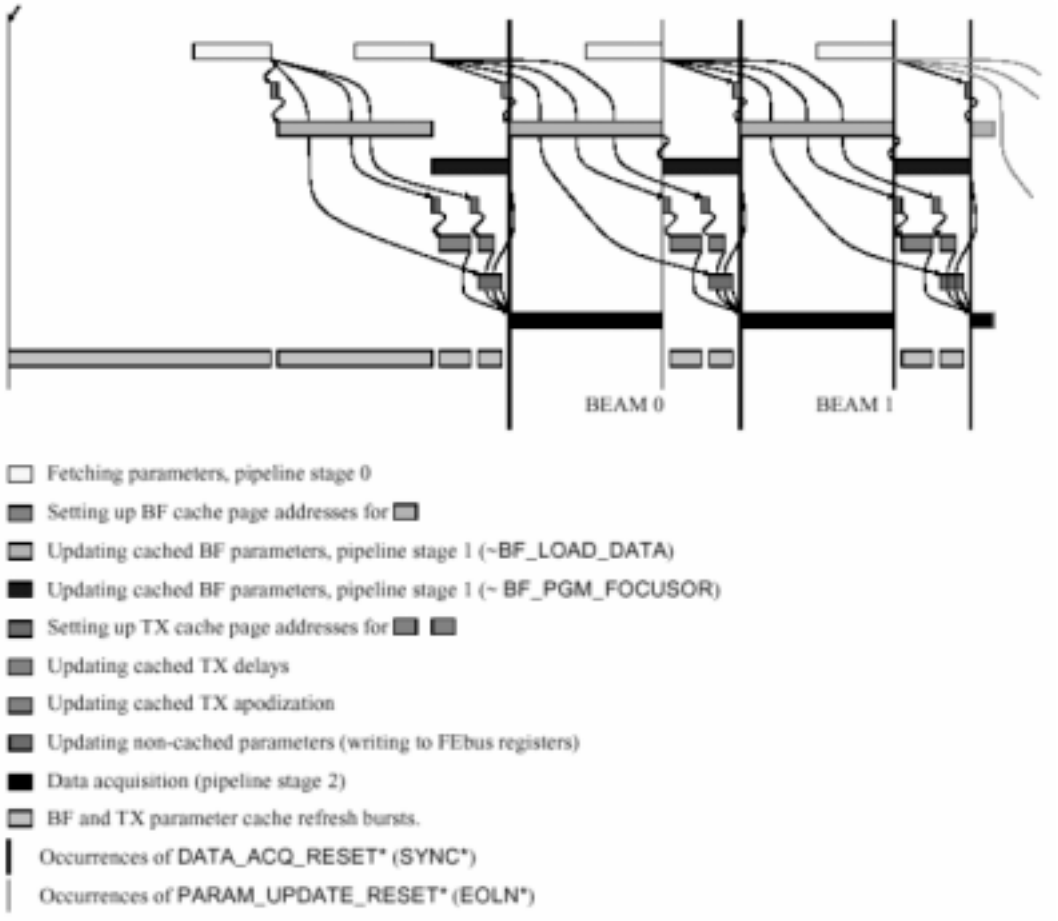


Figure 5-10 Scan Sequencer Periods with Synchronization Signals and BF Strobes

Note: It is possible to program the length of the PARAM_UPD or DATA_ACQ from the module side.

If EOLN_L is generated in the receive chain, the remaining period of the PRT is long enough for the parameter update.

5-4-2-3 Clocks


BEAM 0
BEAM 1
Fetching parameters, pipeline stage 0
Setting up BF cache page addresses for
Updating cached BF parameters, pipeline stage 1 (~BF_LOAD_DATA)
Updating cached BF parameters, pipeline stage 1 (~ BF_PGM_FOCUSOR)
Setting up TX cache page addresses for
Updating cached TX delays
Updating cached TX apodization
Updating non-cached parameters (writing to FEbus registers)
Data acquisition (pipeline stage 2)
BF and TX parameter cache refresh bursts.
Occurrences of DATA_ACQ_RESET* (SYNC*)
Occurrences of PARAM_UPDATE_RESET* (EOLN*)

There are several clocks operating at high speed. These are based on an input 40 MHz clock and include the following:

- DSP_EMIFA - operates at 133 MHz
- DSP_EMIFB - operates at 133 MHz
- DSPCLKIN - operates at 50 MHz (DSP operates at 500 MHz).
- FEINTF receives a 40 MHz clock synchronous to the Front End.
- Demod receives a 40 MHz clock synchronous to the front end.

The following are available for the FE_Main:

- PECL 40MHz I&Q clocks
- PECL 20MHz clock
- PECL synchronized reset signal

5-4-2-3-1 PECL Circuitry

In order to be compatible with the FE boards currently in use, ECL clocks for the backplane have been generated, as follows:

- The FE is supplied with two phases of 40MHz PECL clocks.
- PLCC packages have been avoided where possible.

5-4-2-4 FE Interface

5-4-2-4-1 Analog Interface

- Analog Time Gain Compensation (ATGC)

  The analog RxTx modules signal path is equipped with a voltage-programmable gain stage. The RFI module broadcasts a common analog gain value to the gain stage of all the phased-array element channels. The signal amplification is such that the dynamic range of the analog-to-digital converter and subsequent digital signal processing on the Beam Former board is exploited to the maximum without unacceptable levels of signal clipping.

  The ATGC circuit is essentially a lookup-table in memory, a table index counter and a DA Converter, which converts successive table values to an analog value.

  The ATGC controller is able to load sequences of entries ATGC RAM into the ATGC DAC at a programmable rate, and incorporates the following related features:

  - The RFI provides 32k bytes of ATGC table RAM organized as 32k x 8 bit of RAM; this RAM is internal in an FPGA.
  - The ATGC controller includes a 16-bit preset counter running at 40Mhz, starting from the preset table start when enabled.
  - The counter also includes a programmable pre-scale to enable the counter to run at reduced speed.
  - In addition, the controller includes a state machine generating timing signals to access the SRAM and load the DAC.
  - The D/A converter is (at minimum) an 8-bit converter with complementary outputs.
  - The DAC output is buffered as single ended outputs, 0 to +10V range on both outputs.
  - A test version of the ATGC signal is available on the monitoring circuitry for test purposes.
  - It is possible to read back the contents of the ATGC RAM.

- Test Signal Generator

  The Test Signal Generator synthesizes an arbitrary waveform on the TESTSIG output using an SRAM bank, an 8-bit DA converter, and an address counter. By loading the DA converter with an appropriate set of waveform "data points" and setting the "data point" counter to count through exactly those addresses, the Test Signal Generator generates a waveform. This is achieved as follows:

  - The counter preload register sets the number of data points which will be stepped through when generating a waveform.
  - The counter and DA converter run at 40MHz.
  - The counter and the SRAM bank are implemented inside a FPGA.
  - A fast 8-bit video DAC is used as DA converter.
  - The SRAM bank is (at minimum) 512 bytes.

- DDS (Direct Digital Synthesis) (2nd phase)

  For diagnostics purposes of the Doppler data path, the TESTSIG output is provided by the DDS circuit built into the FPGA. The TESTSIG is connected directly to the 8-bit DA converter.

- Power Supply Signals Distribution

  The RFI board is connected directly with a board-to-board connector to the PS unit.

  The PS connector contains all LV & HV power supplies, as well as 3.3V and 1.8V voltage sensors.

  All LV & HV voltages are routed from the PS through the RF board to the Front End.

- Doppler Audio Path

Discrepancy between audio and video is less than 20msec'; discrepancy with ECG is less than 5msec'.

During Doppler scanning, the DAC conversion signal is the PRF signal generated by the Demod FPGA.

During cine/playback, the DSP generates a synthetic PRF. (For PRF > 30Khz, a decimation is applied by the DSP).

The size of the audio FIFO guarantees continuous audio for 50msec' for the maximum PRF (30KHz').

5-4-2-5 Front End MAIN FPGA

The FE MAIN controls the following functions:

- **Boot CPLD**

  Loads the FPGA with a configuration file sent by the system host via serial loading directly from RFI to the target FPGA.

  Distributes an SRES signal for internal and external use.

- **IHVM & PHVM Control**

  Updates IHVM (Internal HV MUX) and PHVM (Probe HV MUX) at transmit setup.

- **Probe Control**

  This function handles the parallel probe ID of the currently-connected probe.

- **VCA Control**

  Loads the VCA chip to define its base Gain, attenuation range, modes, power control and CW matrix data.

- **Memory Control**

  Reads/Writes 4x (256 Kx16) SRAMs to/from the FE BUS at 16 Bit mode and writes data to the FOC and TPG at Page Transfer Mode.
  TPG SRAM and FOC SRAM reside on the same address and data buses. This is possible because TPG and FOC do not require a simultaneous loading operation.

- **TPG Control**

  Handles the loading of data from TPG memory and FE BUS and *vice versa*.

- **TPG & FOC SRAMs & Data Selector**

  Contains all the tables required for a full image frame. TPG SRAM also contains the data for IHVM and the CW TPG. The Data Selector handled by the Memory Controller defines the destination of output data.

- **CW Control**

  Handles the entire required control signal for CW and pencil circuits.

- **ECL to PECL**

  Converts C40 I/Q clocks. Outputs of the converter are connected to the internal FEMI PECL-to-TTL converter, and to the external PECL-to-TTL converter of TR32.

  Converts SRES H/L signals.

- **PECL to TTL**

  Clock C40I is distributed to FPGA, Boot CPLD and FE bus buffers.

  CW TPG is driven by C40I/Q.

- **TPG Clock Control**

  Enables/disables the TPG C40 clock during transmit cycle only. This action serves to prevent noise from impairing image quality during scanning.

5-4-2-5-1 Signals

The RFI FEBUS uses the same signals as are described in this section. It also includes provisions for making broadcast write accesses to multiple FE boards of the same type.

The FEbus is made up of the signals and busses shown in Table 5-3.

Table 5-3 FEbus Signals and Busses

Signals	Description
C20	Bus strobe and address valid strobe
SAS_L	Synchronous address strobe
SWR_L	Synchronous write select
PGTR_L	Synchronous page transfer select
TACK_L	Transaction acknowledge
SA[4:1]	Main select address bus (FEbus logical address bits 23 to 20)
PA[8:0]	Page address bus (Multiplexes FEbus logical address 19 to 11 and 10 to 2)
SA0	Device select address (FEbus logical address bit 1)
SUDS_L	Synchronous upper data strobe (associated with D [15:8])
SLDS_L	Synchronous lower data strobe (associated with D [7:0])
D [15:0]	16 bit Data bus

- Data Bus (D[15:0])

  The data bus is a 16 bit wide bi-directional bus carrying the data to be read or written.

- **Address Bus (SA[4:0] and PA[8:0])**

  Logically, the FEbus address is a 24-bit (A23-0) byte address. The least significant bit of the logical address (A0) is provided by the SUDS_L and SLDS_L data strobes.

  Physically, the FEbus address bus is divided into two sections, a 5-bit device select address and a 9-bit time multiplexed page address.

  The multiplexer selects either A [18:10] or A [9:1] as PA[8:0].

  The FEbus master (RFI module) always drives the address bus segments.

- **[Device] Select Address (SA[4:0])**

  The SA[4:1] is copied from bits A23-20 of the logical address. The SA[4:1] carries a 4 bit select address, normally fed into an address decoder selecting one or a set of the FEbus slave devices.

  For the FEBUS_BF_PARAM_CACHE and FEBUS_TX_PARAM_CACHE, the SA0 bit is used to select a particular half of a cash RAM, and may toggle for each atomic access during an extended transaction. During system CPU block transfers, the SA0 will typically toggle on every 4th (8 bit width) or 2nd (16 bit width) atomic access (SUDS_L and/or SLDS_L assertion) during an extended transaction.

  For the FEBUS_REGISTER_BLOCK, SA0 is just another select address bit.

- **Page Address (PA[8:0])**

  The PA[8:0] bus time multiplexes bits A18-10 and A9-1 of the logical address.

  The PA[8:0] may toggle for each atomic access during an extended transaction. During system CPU block transfers, the PA[8:0] bus will be incremented for every 8th (8 bit transactions) or 4th (16 bit transactions) atomic access (SUDS_L and/or SLDS_L assertion) following the first one.

  For the FEBUS_REGISTER_BLOCK, PA[8:0] is just a time-multiplexed address; for pure registers, it is an 18 bit select address; for smaller memory devices, it is partly a select and partly a device address.

5-4-2-6 Demodulator

The features of the Demodulator and the functions it controls are described below.

- **Two independent storage banks**

  There are 2 independent banks of pre-stored parameters (coefficients, demodulation waveforms, etc.) available in the hardware.

  RF_MODE(1:0) selects the bank to use for the DEMOD FPGA.

  Both banks are controlled by the DSP and are valid prior to a new acquisition period.

- **Maximum 8K input samples in the range direction**

  Support for 8K input samples in the range direction is provided.

  RANGE limit = 13bit, 8192 @ 20MHz (corresponding to a maximum depth of 315 mm). This is the same as the range limit of the Focusor dynamic focusing state machine.

- **Two 20 MHz data streams with 18 bit each**

  18 bits (the minimum requirement) of valid information are transferred from the TR32 boards (64 channels and 10bit A/D plus 2bit dueInterpolation filter inside the Focusor).

  The demodulator is capable of receiving two data streams at a speed of 20MHz.

- **Complex multiplier resolution**

  The demodulator’s complex multiplier has a 20 * 20 bit resolution minimum.

  This has an output gain adjustment range as used on RFT-1 as a minimum.

- **TGC and demodulator frequency**

  This uses the same technique as on RFT-1 with a RAM-based tabulated TGC vs. depth function.

- **FIR filter**

  The FIR filter uses 18 * 16 bit multipliers.

  Symmetry of the coefficients is not required.

  Even or odd tap filters are selected by setting the coefficient of the last tap to *zero*.

- **FIR filter coefficients and decimation**

  The FIR filter is designed with a selectable decimation factor (i.e. no decimation or 2-16 times decimation).

  The Maximum filter length (number of taps) is proportional to the decimation factor, since each multiplier is 'reused' when decimation is selected.

  Depth (range) dependent filter characteristics:
  A limited number of coefficient banks can be 'swapped' as the depth of the received ultrasound data stream increases.

- **Read-back from registers and RAM**

  Although it is possible to read-back from the TGC and demodulator frequency RAM, this feature is not intended for use except during self-tests.

  A test pattern generator for on-board functional self-test has been added.

- **Corruption of data stream during parameter update**

  It is possible to update the TGC curve and the RegFile without corrupting the data flow.

Note: All other updates will corrupt the signal processing.

- **Demodulator ←→ DSP data transfers**

  Support is provided for efficient DMA data transfers to the DSP, and also from the DSP to the Demodulator, for TGC updates *etc*.

- **CW Processing**

  A separate data path is provided for CW processing. The FIFO controller embedded in the "Demod" FPGA is able to multiplex the incoming data according to the current scan mode.

  The FPGA generates a sampling signal for the CW ADC according to the following formula:

  The SF (sampling Freq.) = PF (Probe Freq.) /N <= 120KHz

  For any given PF, N is calculated by the SW to provide SF that is equal or closest to 120KHz.

  The calculated SF will be 120KHz or a few% less.

- **Demod FPGA Power Management**

  By applying separate controlled clocks to the CW and to the main RF data path, it is possible to assert zero clock(s) to allow power reduction.

5-4-2-7 FEbus Architecture

5-4-2-7-1 Purpose and General Attributes

The FEbus provides a data channel between the RFI module and the other front-end modules (such as, the FE_MAIN TX and TR32 modules) - see Figure 5-12 below.

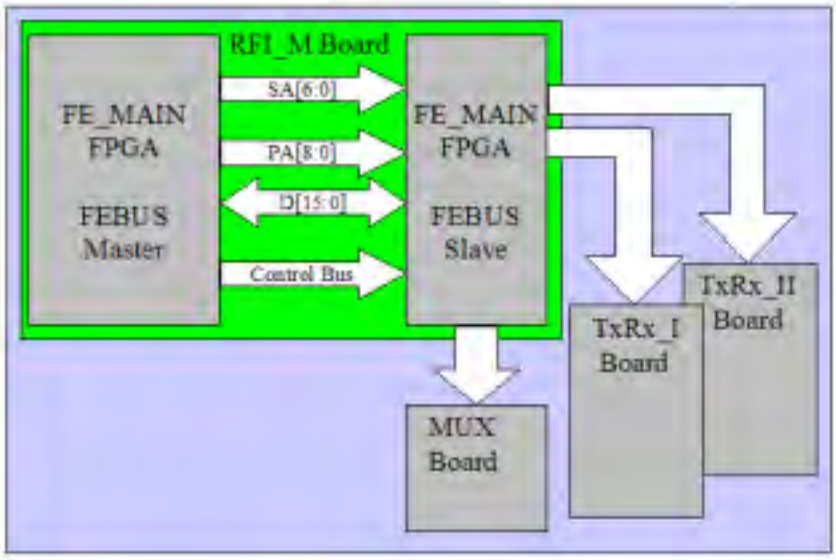


Figure 5-12 FEBus Block Diagram

The RFI module is always the bus master (initiates FEbus transactions). The slave devices must drive data (*read* transactions) or latch data (*write* transactions) at the discretion of the FEbus master.

The FEbus supports only synchronous transactions consisting of an integral number of C40 clock cycles. The FEbus is divided into three sub-busses: *address*, *data* and *control bus*, as depicted in Figure 5-12.

5-4-2-7-2 FEbus Interface

This is the interface between the RFI processor (TMS320C6415) and the FEbus.

The FEbus interface has the following features and capabilities:

- The interface is implemented in an FPGA with necessary bus buffers for address and data on the FEbus side.
- The interface is able to handle two types of FEbus accesses; memory accesses and page transfer accesses.
- A separate memory space is allocated for page transfer accesses. This simplifies page transfers to a normal memory access seen from the processor side.
- The interface is optimized for speed on the processor side to avoid too much idle time for the processor.
- Writing to the memory space allocated by the RFI processor for the FEbus, performs direct access to the FEbus address space.

5-4-2-8 Beam Former Parameter Architecture

The RFI module programmable scan sequencer is capable of updating Beam Former (BF) signal processing parameters in real time.

All the BF signal processing parameters are cached in a memory space located on the BF modules themselves. The RFI module provides a channel to this BF parameter memory space for the system to download multiple sets of parameters.

The BF64 parameters are updated for each beam in a 2D scan (new steering delay) and one scan consists of two or more different Scan Modes requiring different setups of FOC32. These parameters must be loaded into FOC32 before the firing of a new beam. For a full 64 channel, 2 simultaneous lines (MLA's) front-end, there are 2 Mbytes of parameter data for a complete scan.

The System processor calculates all these parameters and loads the data through the PCI bus and then via the FEbus interface directly into the Beam Former board. To avoid FEbus activity during the acquisition period, all parameter data for a complete sweep are loaded into SRAMs located on the BF64 board. Each beam has one page in the SRAMs and a new page is transferred into FOC32 after the previous beam is started, as follows:

- Firstly, the page is transferred into the Parameter RAM inside FOC32 in 4*4 bit serial form clocked by a FOC32 generated SCLK. This action is triggered by LD_DATA.
- Then, the Parameter RAM is transferred to all 32 Focusors inside FOC32. This action is triggered by PGM_FOC.

A 2 bit address (BF_PAGE_SEL<1:0>) selects the type of parameter page to be updated (local static, local scan, global weight or global misc).

5-4-2-8-1 BF Parameter Cache Memory

The BF64 board incorporates static random access read/write memory space for the caching of BF signal processing parameter sets. Each MLA has one SRAM memory component associated with it.

During SRAM write mode, the system downloads parameter sets through the RFI module system parameter interface.

During SRAM read mode, one parameter page is transferred into the FOC32s in bursts using the BF_LOAD_DATA strobe by issuing a page start address to the SRAM.

- **System Memory Map**

  The distinct spaces of FOC32 memory components are mapped into one contiguous, non-overlapping random access read/write memory space addressable from the system for parameter downloading.

- **Temporal Access Considerations**

  The BF cache memory space is accessible by the system only when the scan sequencer is halted. In this manner, FEbus activity is suspended during data acquisition time windows due to noise considerations. Accesses when the sequence is running result in a system bus error condition.

  Local accesses to the FOC32 memory component by the RFI module itself will only occur when the scan sequence is running, and as such will not need to be arbitrated with system accesses.

  The system interface supports 8 and 16 bit wide data transfers, and at an update rate of at least 2048 BF parameter sets per second, corresponding to a transfer rate of 2048[sets] x 32[pages/set] x (256/2)[bytes/page] = 8 [Mbytes] per second (using 16 bit wide block transfers).

5-4-2-9 TX Parameter Architecture

The RFI programmable scan sequencer is capable of updating TX parameters in real time.

The RFI module provides a channel to the TX parameter memory space for the system to download multiple sets of parameters

Note: Some of the TX parameters are cached in a memory space located on the TX module itself, while others are located in the scan sequence parameter words.

5-4-2-9-1 TX Delay, Apodization and RLE Parameter Cache Memory

- **TPG SRAM Memory**

  The TX module incorporates random access read/write cache memory space for the downloading of TX delay, apodization and RLE parameter sets. Each of the TPG components has one pseudo dual-ported memory component associated with it.

  One port is a 16-bit wide random access port, and is used by the system to download the parameter sets through the RFI module system parameter interface. The other port is a serial access nibble-wide port, which propagates the parameter data into the TPG's in bursts. All 4 TPG's are loaded in parallel. The serial port is given access to a page of data by issuing a page start address to the random access port.

- **System Memory Map**

  The distinct spaces of TPG memory components are mapped into one contiguous, non-overlapping random access read/write memory space addressable from the system for parameter downloading.

  The addressing of the individual parameter nibbles with respect to TPG node is organized in such a way as to simplify the hardware needed for interfacing the system bus to the parameter memory space while maintaining a high transfer rate.The TX_PARAM_CACHE memory space is regarded as TX_PARAM_SET_LIMIT segments.

  The value of TX_PARAM_SET_LIMIT reflects the maximum number of delay parameter sets which can be stored in the TX_PARAM_CACHE memory. Since an apodization set is half the size of a delay set, two apodization sets can be stored in a delay set segment.

  The system is responsible for keeping track of the allocation of different segments of the TX_PARAM_CACHE memory to delay and apodization parameter sets.

- **Temporal Access Considerations**

  The TX_PARAM_CACHE memory space is accessible by the system only when the scan sequencer is in the SCAN_HALTED state.

  In this manner, FEbus activity is not performed during data acquisition time frames due to noise considerations. Accesses when the sequence is running will result in a system bus error condition.

  Local accesses to the TPG memory component by the RFI module itself will only occur when the scan sequence is running, and as such will not need to be arbitrated with system accesses.

  The system interface supporta 8 and 16 bit wide data transfers.

  The system supports an update rate of at least 8192 complete TX delay parameter sets per second. This corresponds to a transfer rate of 8192[sets] x 16[pages/set] x 64/2[bytes/page] = 4[Mbyte] per second (using 16 bit wide block transfers).

  This rating pertains to delay parameter sets only; apodization sets are half the size and also assumed to be substantially fewer.

5-4-2-9-2 Boot-up of DSP and Firmware

When the power is turned ON, the DSP is reset, and all FPGAs are blank. The DSP is connected to PCI directly, and can only boot up with help from the Host.

- **Program Download**

  The DSP peripheral registers are always available from the Host; they are always mapped into the Host memory. In order to download a program, the following procedures must be performed:

  1.) The PCI memory map must be set up.
  2.) The DSP external memory (SDRAM timing) must be configured properly.
  3.) The program can then be written to the SDRAM or internal memory
  4.) When this is completed, sending a PCI interrupt will start the DSP program.

- **FPGA Download**

  The FPGAs contain no configuration upon power-ON; FGPA Download proceeds as follows:

  1.) The actual FPGA contents (bit-streams) are written into DSP memory from the Host.
  2.) The DSP configures serial port 0 to aid configuration.
  3.) The DSP writes the bit-streams to serial port 0.
  4.) The DSP verifies that the FPGAs are configured correctly.

5-4-2-9-3 PCI Interface as Viewed from the DSP

The DSP can access the PCI bus as a bus master by using the following registers:

- DSPMA (DSP master address register)
- PCIMA (PCI master address register)
- PCIMC (PCI master control register)

5-4-2-9-4 PCI Interface as Viewed from the Host

All DSP memory mapped registers are always visible to the Host. These are mapped into DSP memory space starting at 0x1800 0000 (Base 1 memory: 8 Megabyte non-prefetchable memory).

A selectable, 4 Megabyte DSP memory mapped area is visible to the Host; the actual area can be selected by programming the DSPP register. This will be mapped into SDRAM as a shared memory communications buffer.

There is also a 16 word I/O area which contains I/O registers for the PCI host.

5-4-2-9-5 Power Management

Power Management in the various Modes is controlled as follows:

- **SCAN Mode** - During all scanning modes, ETX, DSP and Front-End are fully operative and consumes maximum power.
- **FREEZE Mode** - When the user has pressed the FREEZE button, or the system is in IDLE for more than 5 minutes, the FE is powered OFF. When the FREEZE button is released or the user enters into a new scanning mode, the FE is powered ON, and DSP SW and FPGAs firmware are loaded.
- **WORKSTATION Mode**- Same as in Freeze Mode (see above).

- **STANDBY Mode** – The ETX is forced into Standby Mode while the application is running (suspend to RAM or disk). To recover, the DSP is reset and commanded to 'LOAD ALL FPGAS'. If the system is left in this mode until such time as the battery level is decreased below M1 threshold, the ETX will be forced into Full Shut Down.

The RFI hardware and DSP software supports power-down modes in such a way that it is able to:

- Power down external FPGAs (e.g. by stopping clocks).
- Disable external termination resistors (on the Address/data lines of the QDR SRAM).
- Force monitoring HW into *Standby Low Power Mode* between readings.
- Extend the PARAM_UPD period when Vivid-i™ operates on batteries.
- Disable ADCs and Beam Formers when working in CW Mode.
- Disable CW circuitry when not-working in CW Mode.

5-4-3 TR32 Boards (Front Boards)

5-4-3-1 General Description

The Front Board (FB) has 64 receive channels and is made up of two identical TR32 boards: *TR32A* and *TR32B* (see Figure 5-14 below). Each TR32 board is a complete 32-channel ultrasound Front End that includes the following features and functions:

- 32 Transmitters
- 32 receiving channels, T/R switch, Pre –Amp, TGC
- 32 channel Beam Former
- First stage of Analog Beam-Former for CW mode, included in the receive input ASIC
- Clock distribution, starting with input at PECL level

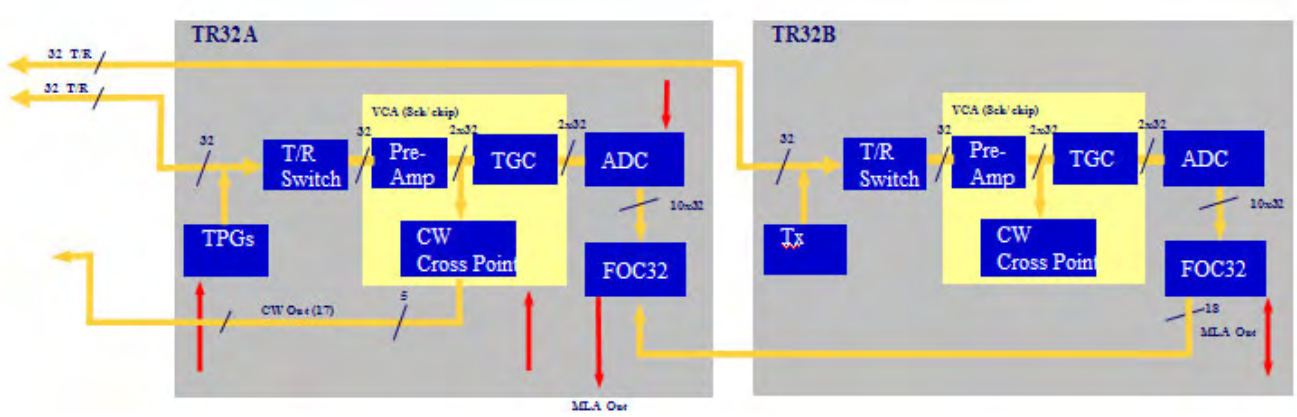


Figure 5-14 Front Board TR32 Block Diagram

Each TR32 board has 32 channels and includes a 32-channel Digital Beam Former (consisting of one FOC32 ASIC).

Inputs are 32 probe lines that have gone through aperture selection (HV MUX function), performed in the
PM board. Outputs are MLA0 and MLA1 digital buses from the Beam Former and CW output lines to the Analog CW BF.

The MLA output bus of TR32B is connected to the MLA input bus of TR32A, giving a 64-channel BF on the MLA output.

All required control, memory and clocks for the two TR32 boards reside in the RFI board (refer to Radio Frequency Interface (RFI) Board on page 5 - 10).

For reference, a list of abbreviations used in this section is provided in Table 5-4 below.

Table 5-4 Abbreviations and Definitions

Abbreviation	Definition
TGC	Time Gain Control function
ASIC	Application Specific Integrated Circuit
BF	Digital Beam Former (as opposed to analog beam former)
ADC	Analog to Digital Conversion
MLA	Multi line Acquisition
RFI	Main logic board in Vivid-i™

The signal in each channel is fed via a Transmit/Receive (T/R) switch to a preamplifier. The T/R switch limits the Pre-Amp input when high voltage *transmit* pulses exist. The Pre-Amp provides fixed gain for all probes except Pencil probes.

Thereafter, a Time Controlled Gain (TGC) amplifier equalizes the signal strength from the near-, mid-, and far-fields. The TGC + low pass filters provide minimal gain compensation to keep system noise within the dynamic range. (A low pass filter is an anti-aliasing filter prior to signal sampling).

The CW Cross point is the first stage of the analog Doppler processor function, included in the input ASIC. The rest of the analog Doppler processor is located on the PM board.

5-4-3-2 TR32 Board Operation

5-4-3-2-1 Overview

The Vivid-i™ is fitted with two TR32 Boards each containing 32 transmit and receive signal channels, and a 32-channel Digital Beam Former.

The two TR32 Boards are linked together in parallel. The way in which they operate depends upon the probe currently in use, and also on the current type of Transmit/Receive mode.

Transmit/Receive modes can be divided into two types, as shown in the following examples:

- CW Mode - half the channels *transmit* signals, and half the channels *receive* signals, simultaneously.
- 2D Mode - signals are propagated between the channels; there is a specific time delay between *transmit* and *receive* - data is then interpolated in accordance with the delay, and the image is created.

The TR32 Boards are connected to the RFI Board by stacked connectors, as shown Figure 5-15 below. These connectors are described in detail in *Interfaces* on page 5-37.

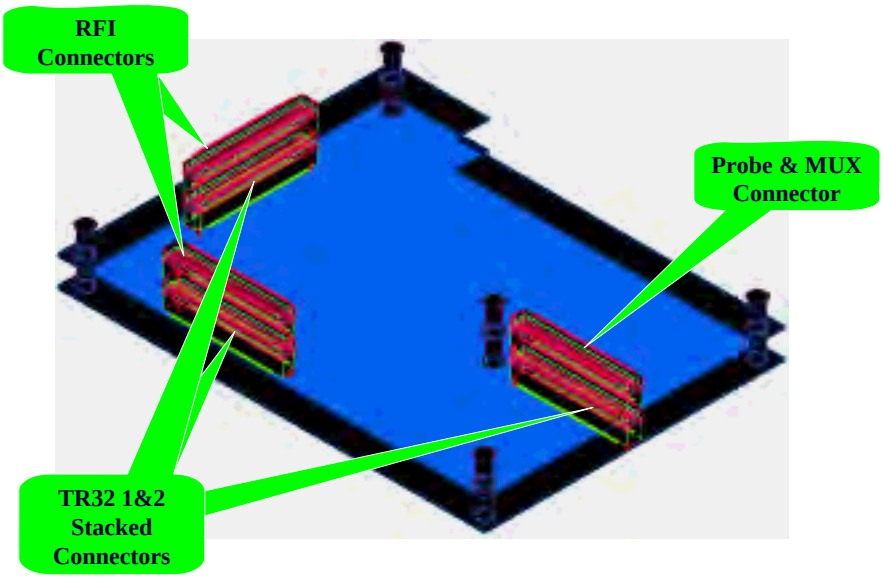


Figure 5-15 TR32 Board Connectors

5-4-3-2-2 TR32 Board Block Diagram and Functional Operation

Figure 5-16 below shows a block diagram of a single TR32 Board.

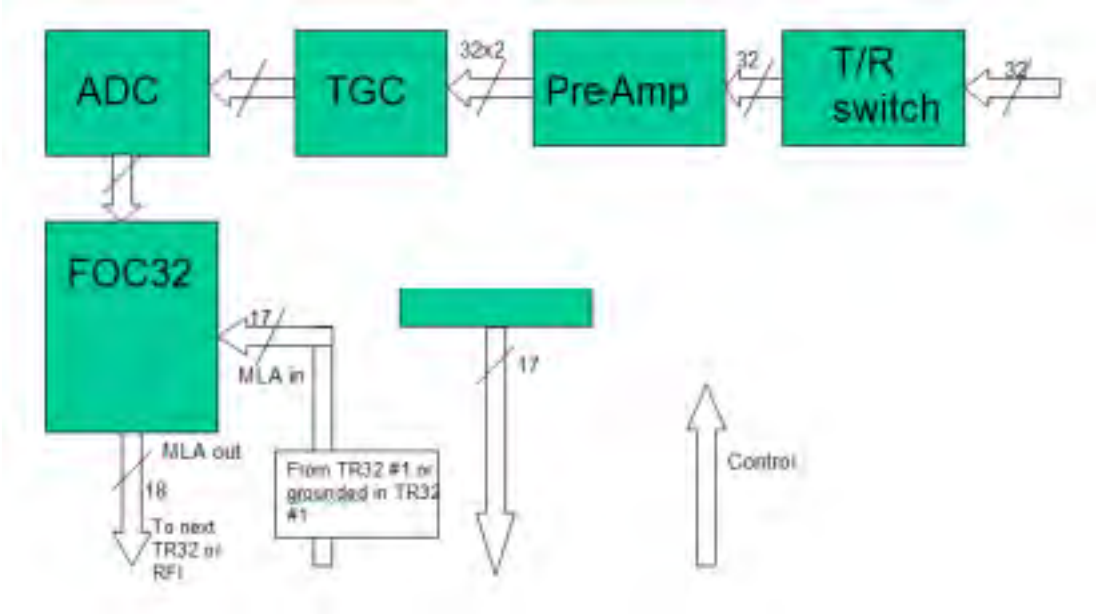


Figure 5-16 Single TR32 Board Block Diagram

Each of the two TR32 Boards contains 32 transmit and receive signal channels, and a 32-channel Digital Beam Former. Each channel has two pulsars for different transmitted Tx voltages, and a low-signal receiver amplifier. Both are connected to the same input/output line. The receiver is buffered from the transmitted voltage (up to 80V) by an electronic switch to avoid high voltage on the receiver input.

The functions of the TR32 Board components (refer to Figure 5-16) are as follows:

- T/R switch - limits Pre-Amp input level when high voltage transmit pulses exists.
- Pre-Amp - provides fixed gain for all probes except Pencil probes.
- TGC + low pass filters - provides the minimal gain-depth compensation to keep system noise within the dynamic range. Low pass filter is an anti aliasing filter prior to signal sampling.
- CW Cross point - the first stage of analog Doppler processor function, included in the input ASIC.
  The rest of the analog Doppler processor is located on the PM board.
- BF ADCs - 32ADCs, 10 bit, in 4 ASICs, Used as digital BF interface.
- 32-channel Digital Beam Former - comprises one FOC32 ASIC. The MLA output bus of TR32 #1 is connected to the MLA input bus of TR32 #2, giving a 64 channels BF on the MLA output of TR32#2.

Each of the above components is described in detail (see below).

5-4-3-3 Interfaces

Each TR32 board contains three 120-pin stacking connectors, on each side of the board.

The stacking connection method forces the lower side connectors to be located exactly on the same locations as those on the upper side connectors. The designation is as follows:

- Analog connector: One 120-pin connector on each side of the board.

  Carries 64 input lines and 17 CW out lines (shorted to 5 lines in the PM board).
- Digital connectors: Two 120-pin connectors on each side of the board.
- Number of pins used: Digital connector 1:107 including power & GND
  Digital connector 2:113 including power & GND
- Clocks: 3 pairs of PECL inputs.

5-4-3-4 T/R Switch

Standard 4 diode current limiting circuit operated by a single 5V.

- Current per diode: 1ma
- Signal coupling: AC input and output

5-4-3-5 Pre Amplifier

- Input impedance: 400 OHM in parallel to GND. Defined by the external circuit.
- Input signal range: 200mv ptp.
- Gain: 20db differential in TGC signal path, 14 db in CW path.
- Input referred noise:2nv/root Hz including external circuit.

5-4-3-6 TGC

- Gain range: the low gain range -15db to +25db of the ASIC has been selected (gain selection is software controlled)
- Output signal range: Differential, 0.5Vptp for each output.
- Gain control signal amplitude at board input:0: 10V
- Output low pass filter: 2pole, 11Mhz, serves as anti aliasing before the 40Mhz sampling by Beam former ADCs.

5-4-3-7 Pulser

- Bipolar with GND clamp on positive residue of excitation waveform.
- Peak current: +/-0.75A
- Peak voltage: +/-80V
- Rise & Fall times < 15Nsec
- Pulser driver: 5V logic using ACT logic family drivers

5-4-3-8 CW Processor in Receive ASIC

5-4-3-8-1 Overview of CW Beam Former

The CW processor is the first stage in an analog Beam former operating in CW mode. The CW beam Former provides high dynamic range sum and delay for 28 receive channels used in for CW receive path.

The VCA8612 chip includes 8 CH; it is capable of connecting each of the 8 inputs to each of the 5 outputs, in any combination.

Polarity of LNA output for each input of the cross point network can be selected. The 5 output lines are common to the 4 VCAs on the board, thus only 5 lines that correspond to 5 delay values are output from the board.

The actual number of CW outputs is 17 but they are shorted in the PM board to give 5 lines that correspond to the 5 outputs of the VCA.

5-4-3-8-2 CW Processor

The 5 CW outputs that are the result of shorting in the PM board are routed to 7 delay taps. The routing scheme is TX-frequency dependent, having 3 routing possibilities.

The sequence is as follows:

- At any TX frequency, only 5 delay taps are accessible.
- Output current at each CW output: 1.4ma ptp +2ma bias, per single input CH.
- Current sum may reach 56ma bias + about 10ma peak signal
- CW output impedance: (16k Ohm in parallel with 2pf)/CH.
- Impedance of the combined 5 lines – 4k ohm with 8pf.
- Output voltage compliance: 3V to 3.3V.

5-4-3-9 Receive ASIC setup

Setup of a single VCA8612 is done by a serial stream of 40 bits. 4 ASICS on board are cascaded, so 160bits are used.

Load process is controlled by chip select and clock lines.

Clock load frequency = 20Mhz.

Control lines:

- **S_DATA_IN**: 160 serial data bits
- **VCA_CS_L**: active for load period
- **VCA_CLK**: 160 clock pulses, 20 Mhz, active only during VCA setup.

5-4-3-10 Transmit

Each of the two TR32 boards includes 2TPG ASIC chips, supporting 16 transmit channel each. The 32 Pulsers are driven by 32 ‘P’ and ‘N’ pairs of the TPG outputs - see Figure 5-17 below.

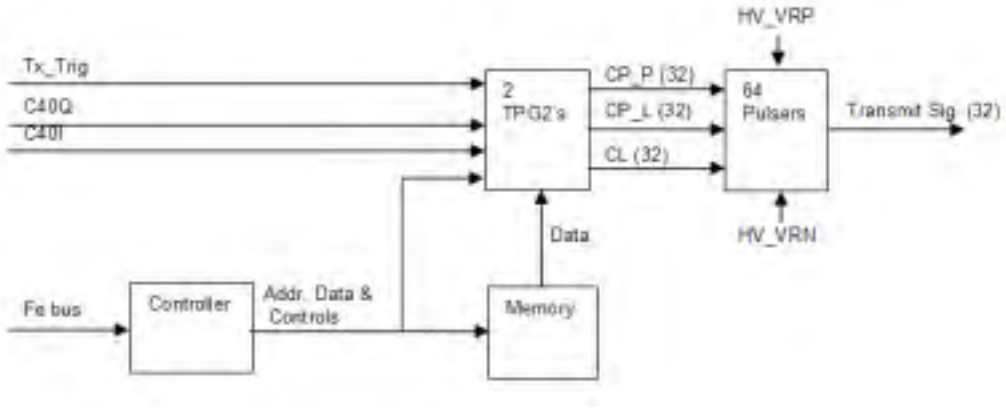


Figure 5-17 TPG Functional Block Diagram

Using the TPG2 at RLE mode, provides much more flexibility in the transmit waveform. This has been used in Vivid-i™ to support PWM mode of operation to control acoustic power.

The RLE uses a separate memory page in addition to the delay page.

5-4-3-11 BeamFormer Description

The Beamformer contains the A/D converter, the ASIC (called the Focuser [FOC]) and a Beam Adder (BA) - see Figure 5-18 below**.** The BF Board accepts input channels and converts each channel to digital bytes.

The system requires two TR32 Boards which together scan 64 channels.

The digitized samples at the ADC output are input to the FOCs, whose outputs go to a BA. The output of the BA (BA Level 2) is the sum of the input channels, which is added together with the output from the other BA Level 2, as shown in Figure 5-22 on page 5-54.

These ASICs will add all the input and output channels, with appropriate delay, to give optimal receive focusing and beam steering as a function of time. All focusing and steering parameters for a scan are stored in RAM on the RFI Board. The output of the TR32 Board is a high-frequency digital Word update. This output can be added to any successive board, if more channels are required.

- **BF Calibration:** The system has a calibration procedure for the BF, which sets the offset voltage for the ADC on the TR32 Board. If the TR32 Board is replaced, the calibration procedure has to be performed, as described in Beamformer Calibration on page 6 - 3.

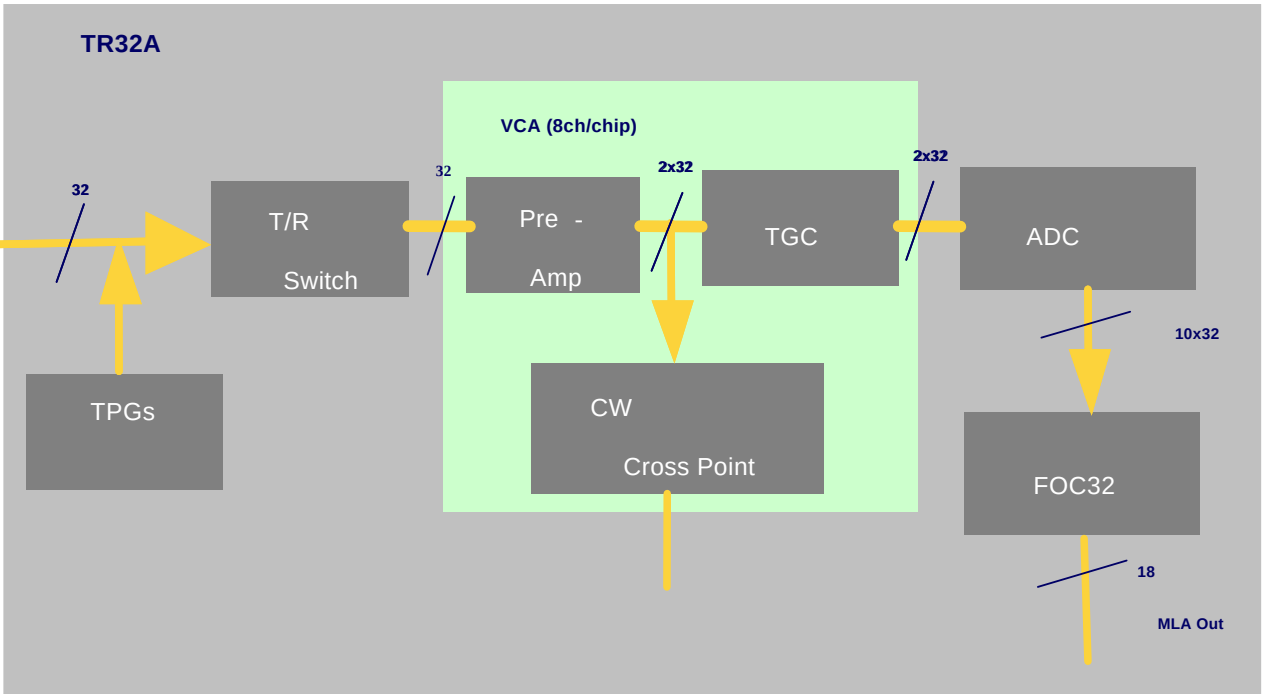


Figure 5-18 TR32A Board Block Diagram

5-4-4 Probe and MUX Board

5-4-4-1 General Description

The Probe and MUX (multiplexer) Board (see Figure 5-20 below) has 128 receive/transmit channels, and performs the following functions:

- Receiving the channels and connecting them to the TR32 Boards.
- Array and Pencil Probe connectors (mounted via a flex print)
- HV MUX that selects 64 out of 128 inputs (IHVM)
- Analog Doppler processor for CW mode
- Pencil probe transmitter and Pre – Amp.

The Probe and MUX Board is connected to the TR32 via the connectors and also has a separate connector to the RFI board for CW processing, as shown in Figure 5-20 below.

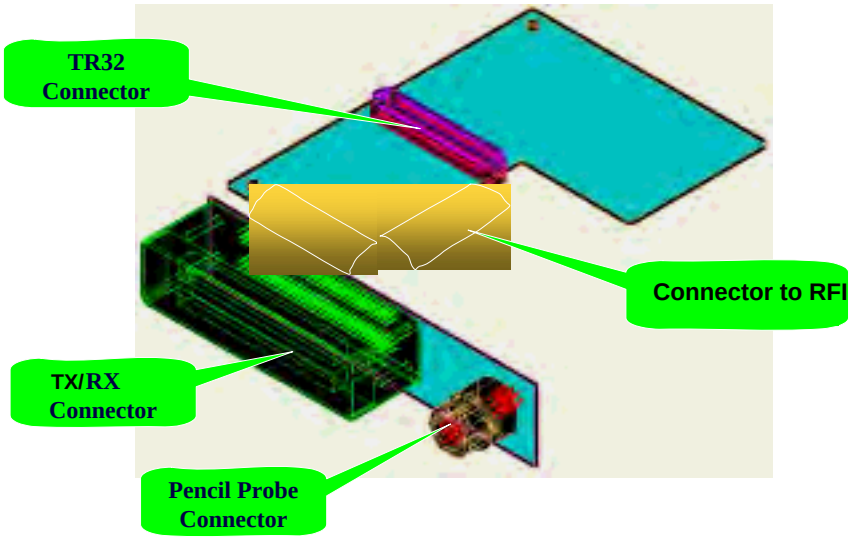


Figure 5-20 Probe and MUX Board Connectors

For reference, a list of abbreviations used in this section is provided in Table 5-5 below.

Table 5-5 Abbreviations and Definitions

Abbreviation	Definition
P&M	Probe and MUX board
IVHM	Internal HV MUX
PHVM	Probe HV MUX

5-4-4-2 Probe & MUX Board Block Diagram and Functional Operation

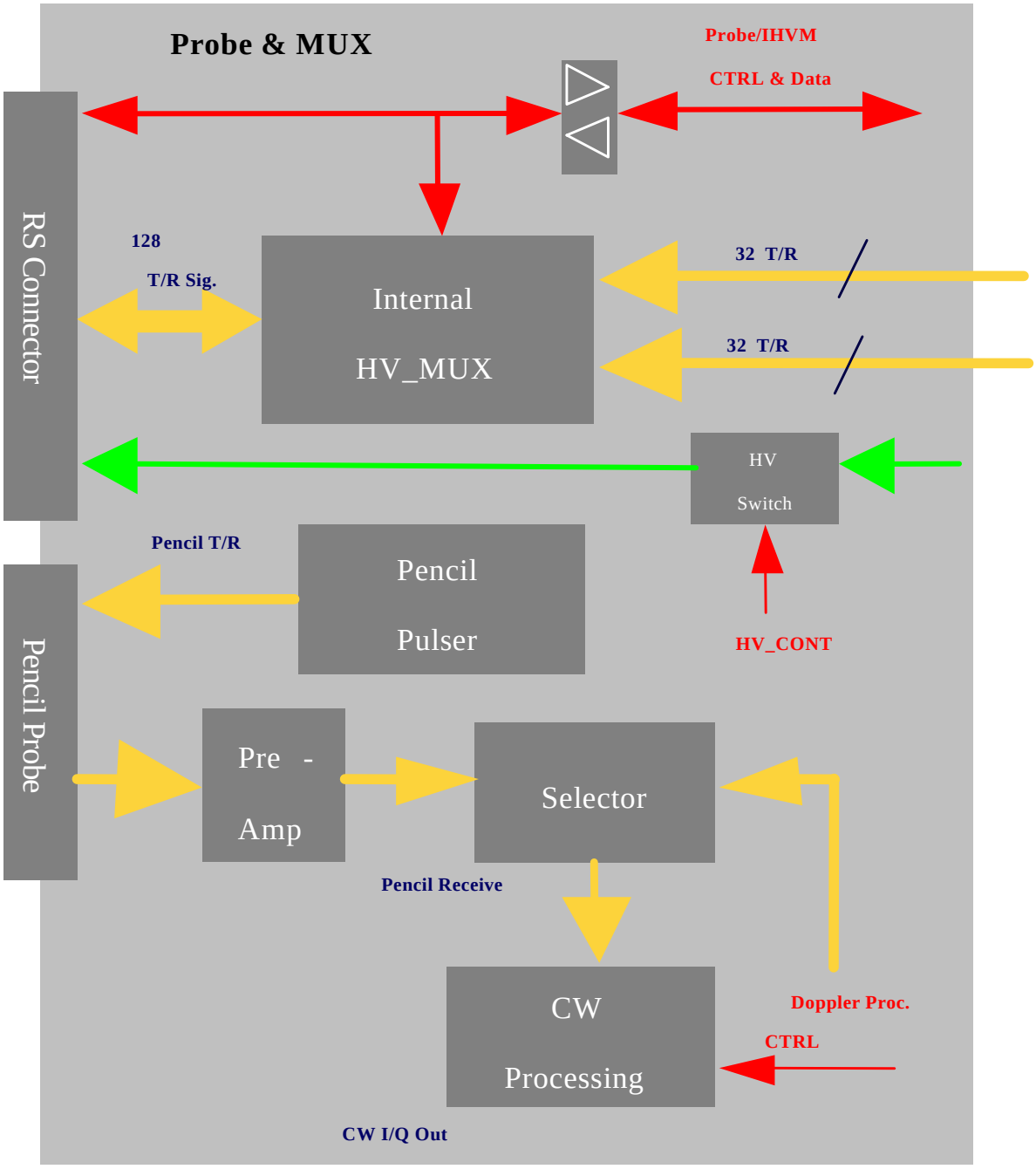


Figure 5-21 Probe and MUX Board Schematic Block Diagram

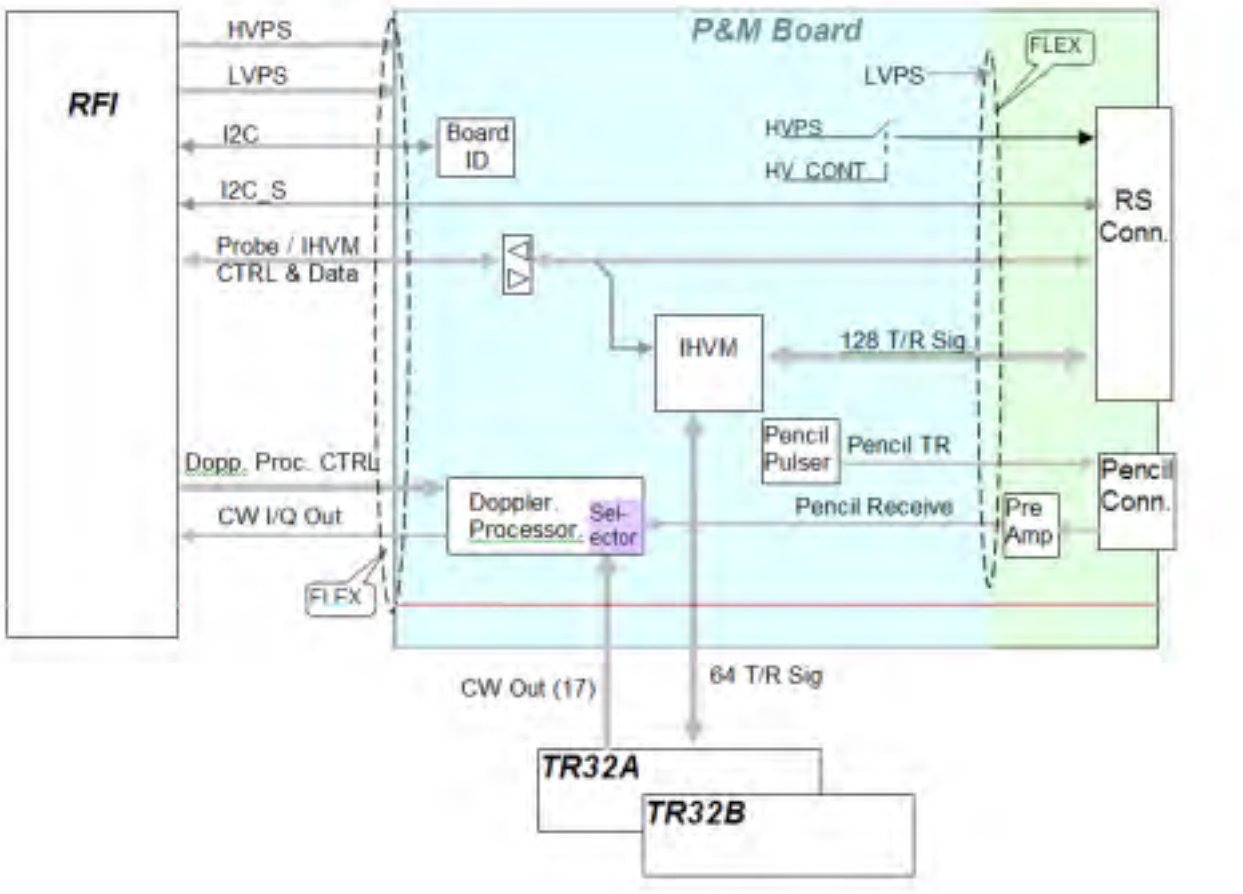


Figure 5-22 Probe and MUX Board Functional Block Diagram

The Probe and MUX Board components and the functions they control are as follows:

- **IHVM** - Internal HV MUX, routing the128 input channels from the probe connector to 64 input-outputs on TR32 boards
- **Pencil Circuit** - contains the pencil's Pulsar and receive Pre amplifier
- **Analog Doppler Processor** - a signal path for CW mode, containing analog Beam Former, Band Pass filter, I/Q base band converter, high pass filter.
- **Selector** - Input to BPF & I/Q path selected: Analog BF or Pencil Pre-Amp.
- **Board ID** - implemented on I2C PROM. One I2C bus is used for ID of all the system boards.
- **HVPS** - HVPS for use by an external probe is switched OFF, if no probe is present at the probe connector - see Figure 5-20 on page 5-41.

Each of the above components is described in detail (see below).

5-4-4-2-1 IVHM

The IHVM (internal HV MUX) is a set of 128 high voltage analog switches, arranged in 16 chips of 8 switches in each. The control is capable of setting any combination of ON/OFF states.

It is used to connect any contiguous group of 64 lines out of the 128 probe lines. The 64 outputs are directed to the TR32 boards, 32 lines for each board - see Figure 5-23 below..

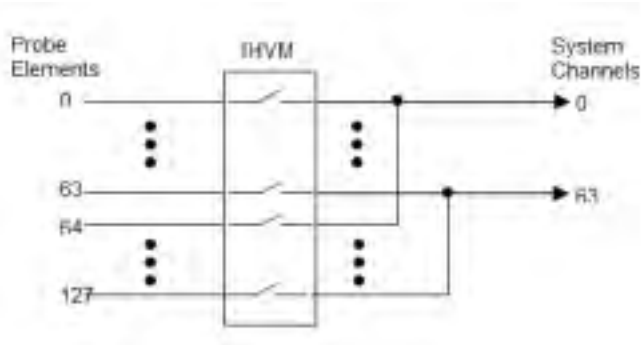


Figure 5-23 IVHM Controls

5-4-4-2-2 Analog Doppler Processor

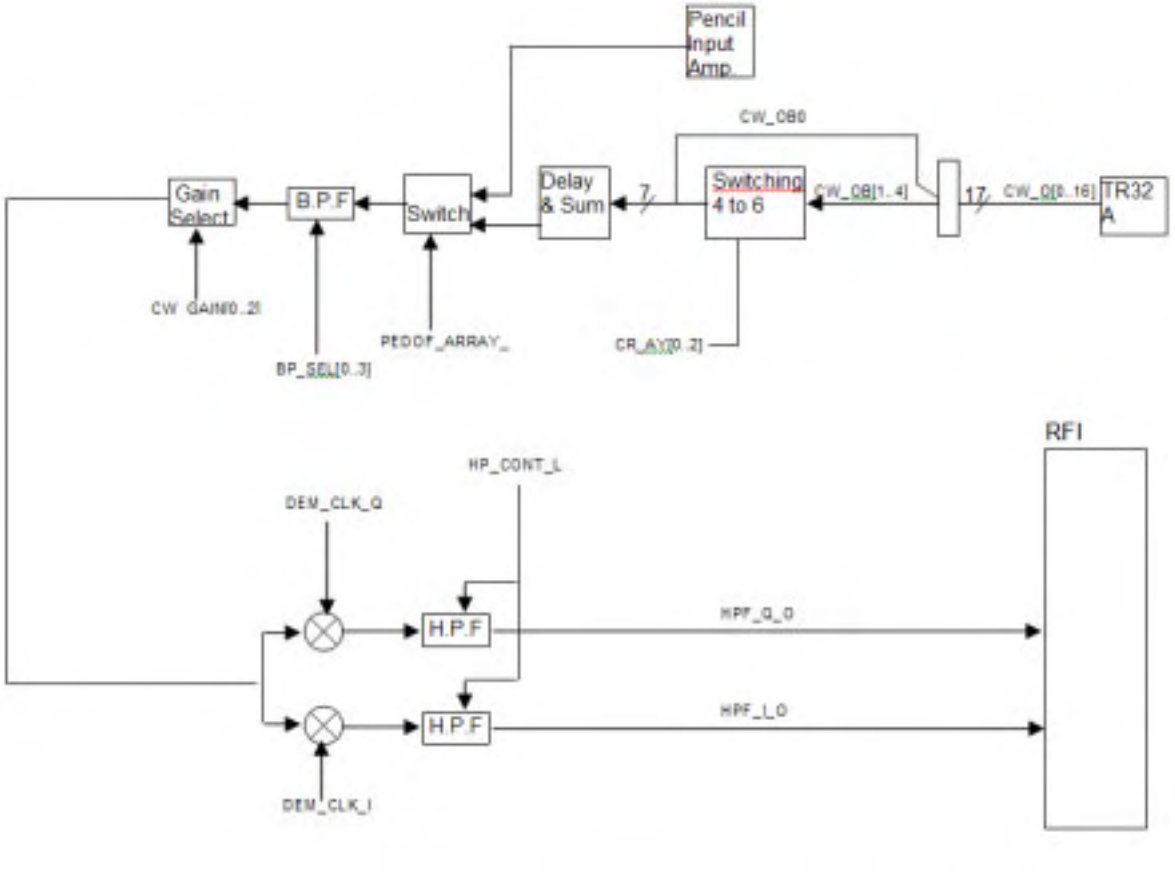


Figure 5-24 PM Analog Doppler Processor

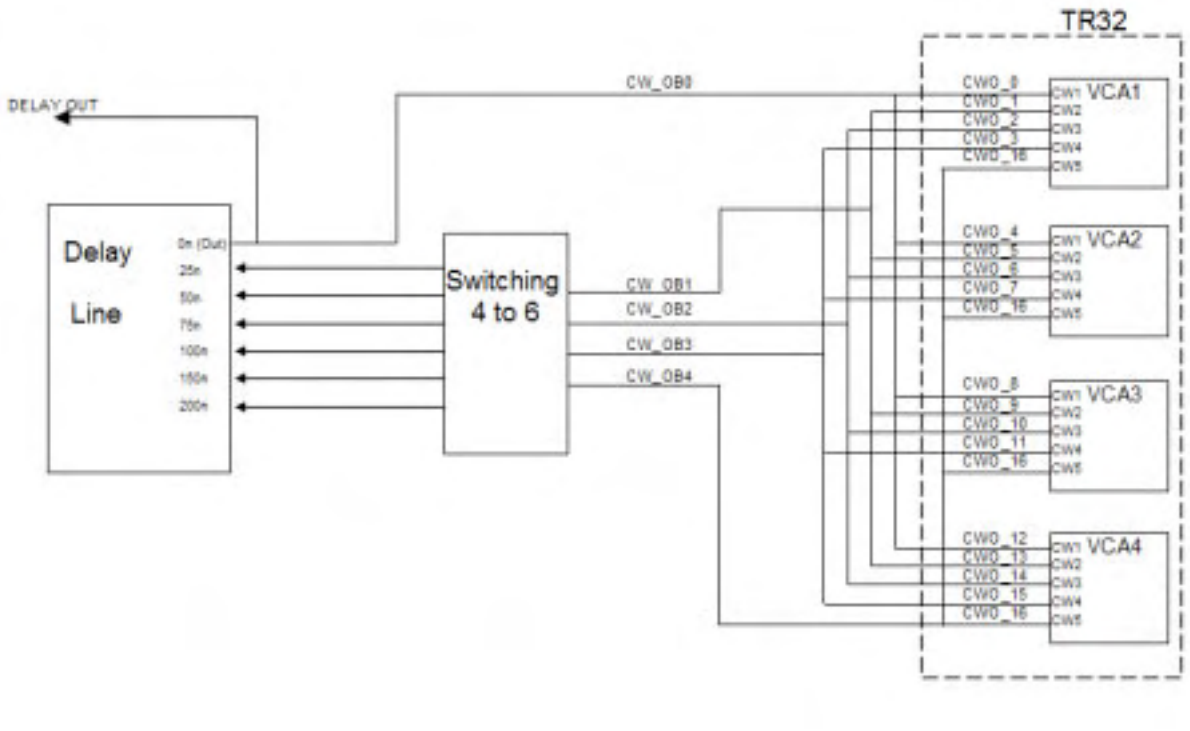


Figure 5-25 TR32 Analog Beam Former Connection

When using an array probe for CW less than half of the 64 input Channels are used (actually 28, because 4 Channels on each side of the probe center are unused), to avoid excessive crosstalk between *Transmit* and *Receive* probe elements. The 28 receive channels are all from the TR32A board (closer to the RFI).

The CW Beam Former is distributed between the TR32 boards and the PM board.

A crosspoint switch (XPT) inside the ATGC chips routes each one of 8 differential PRE-AMP outputs to one of 5 output lines. Of the 20 CW outputs of the VCAs, 17 lines (CWO_[0:16]) are grouped.

Each of the 28 input signals will undergo one of 5 selectable delay values. For a given probe frequency, the 5 delay values can be selected from a group of 7 values.

5-4-4-2-3 IVHM and PHVM Loading

Loading of the IHVM and PHVM occurs at different times since they use the same data loading lines (STA).

Three modes are implemented in the loading controller, as follows:

- IHVM Disable Mode - at power-up, all IHVM switches are programmed to OPEN.
- IHVM Control Mode – loading the IHVM.
- PHVM Control Mode – loading the PHVM. Before entering to this mode, all the IHVM switches are programmed to CLOSE position.

5-4-5 CW Circuitry

This section describes the interface between the CW analog BF data path and the DEMOD FPGA located on the RFI board.

On the Vivid-i™ system, the CW BF data path is separated from the 2D and PW data path due to the requirement for low power and space imposing the use of a highly integrated 8ch 10bit ADC, compared to the 12bit ADC currently found on the Vivid™ 3 system. To avoid a compromise on the CW performance, the CW circuitry has been implemented using an analog BF which is merged back into the DEMOD FPGA.

The I and Q Analog CW BF outputs are converted by two serial 16-bit ADCs that are directly fed to the FPGA Demodulator bypassing the digital BF - see Figure 5-27 below..

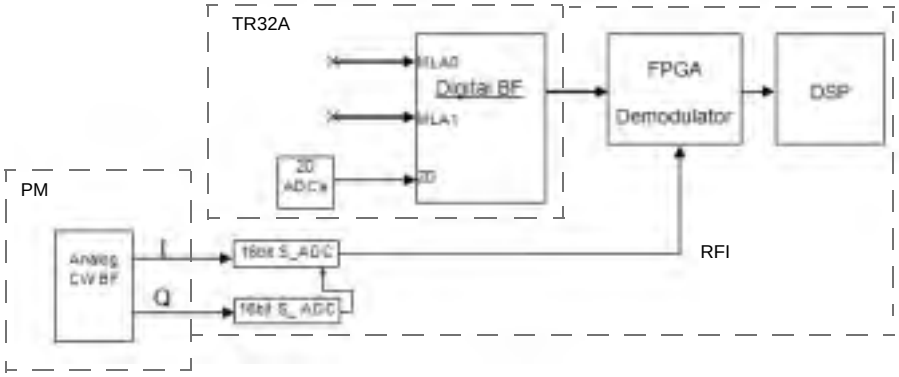


Figure 5-27 CW Signal Path from PM to RFI

When in CW mode, the clocks on two digital BF(FOC32) are disabled to reduce the power consumption (by approximately 1W).

5-4-5-1 Interface

To use this module, it is first required to set the N Value for determining the ADC convert frequency as follows:

- F(adc_convert) = 40MHz / N

When entering CW mode, the module generates the convert signal for the ADC and transfers the serial ADC data to parallel data.

The data carries two parameters: I and Q. The I data is valid when FIRST and DATA_VALID signals are ‘1’; the Q data is valid when FIRST is ‘0’ and DATA_VALID is ‘1’..

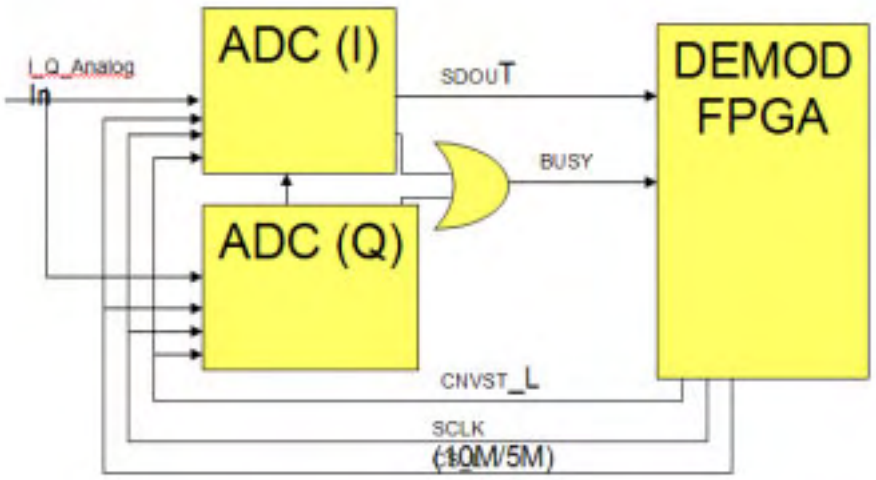


Figure 5-28 CW Schematic Block Diagram

Section 5-5
Back End Processor

5-5-1 Introduction

The Back End Processor (BEP) supports the operation of the Vivid-i™ ultrasound unit and is the main controller for the system.

A block diagram of the BEP is provided in Figure 5-29 on page 5-50.

The various components that comprise the Vivid-i™ BEP are described in the following sections:

- ETX SPC Central Processing Unit (CPU) on page 5 - 51.
- ETX Base Board on page 5 - 52.
- BlueTooth Module and Antenna on page 5 - 58.-
- Hard Disk on page 5 - 58.
- 15" LCD Monitor on page 5 - 73

For reference, a list of abbreviations used in this section is provided in Table 5-5 below.

Table 5-6 Abbreviations and Definitions

Abbreviation	Definition
P&M	Probe and MUX board
BGA	Ball Grid Array
CS	Component Side
EMC	Electro Magnetic Compatibility
FPGA	Field Programmable Gate Array
HDD	Hard disk drive
HDS	H/W Detailed Specifications
MTBF	Mean Time Between Failures
PCI	Peripheral Card Interconnect
PLD	Programmable Logic Device
PMC	Power Management Controller
PS	Power Supply

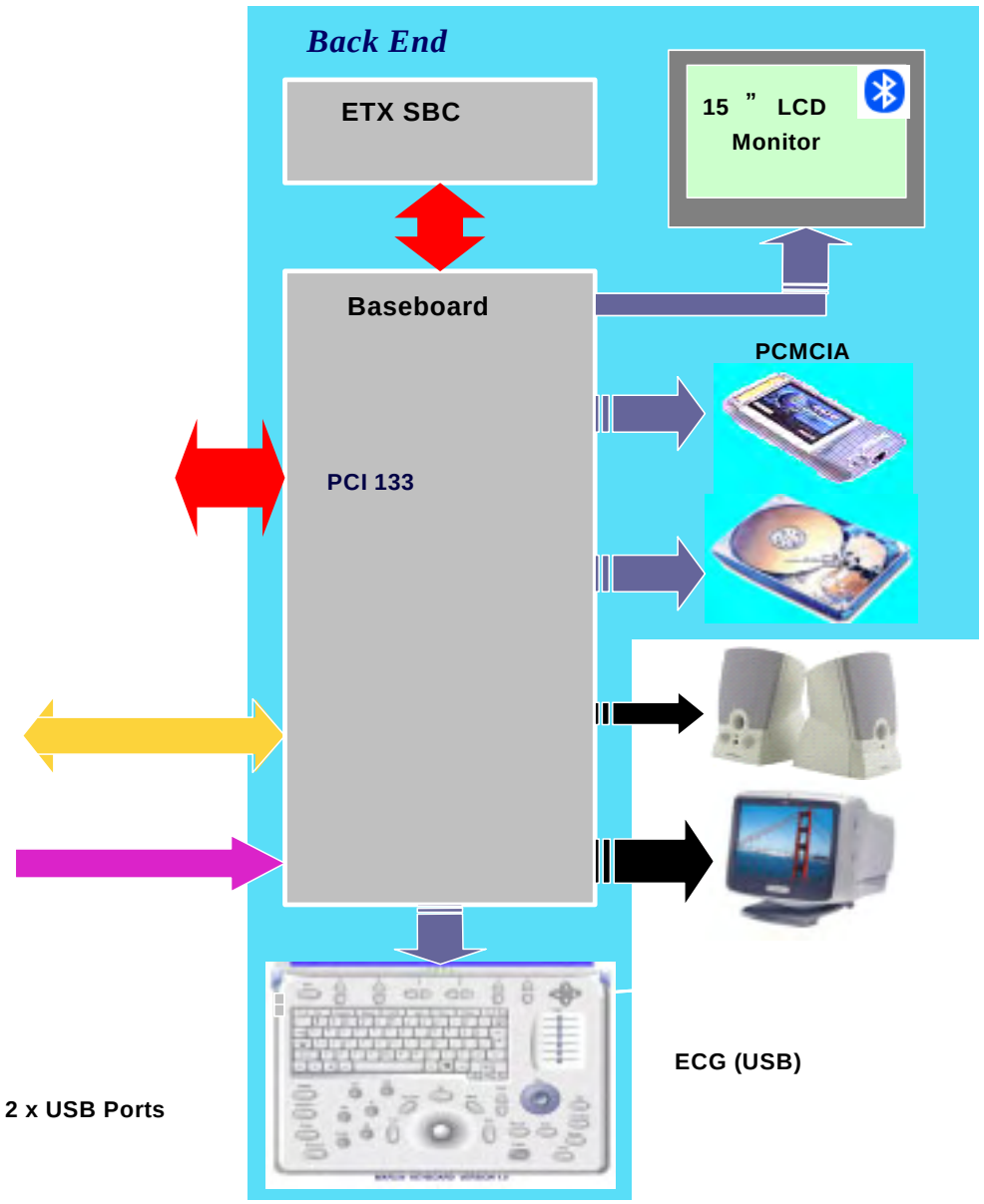


Figure 5-29 Vivid-i™Back End Processor - Block Diagram

5-5-2 ETX SPC Central Processing Unit (CPU)

The ETX SPC Central Processing Unit (CPU), which is mounted on top of the ETX Base Board (see page 5 - 52), controls and processes the internal Back End Processor operations. In addition, the CPU supports the Front End via the PCI bus.

The CPU utilized in the Vivid-i™ ultrasound unit is a Pentium III, 700 MHz Intel Processor, or Pentium III m (up to 1.2 GHz) (optional).

5-5-3 ETX Base Board

5-5-3-1 Overview of ETX Base Board Functions

The ETX Base Board connects all the peripheral modules to the ETX single board computer. The CPU (see page 5 - 51) is mounted on top of the ETX Base Board using four low-profile SMT connectors.

The ETX Base Board provides interfaces to the following components:

- HDD
- External CardBus modules
- RFI board
- USB ports
- Docking port
- Speakerphones and speaker jacks
- External VGA monitor
- Thermal sensors
- Fans
- Power supply

The Power Management Controller (PMC), mounted on the ETX Base Board, ensures automatic transition between the various power modes, stable DC condition, and provides power status LED display.

The Docking port, located on the rear panel, provides the connections to external peripheral devices including: VGA monitor, up to four USB devices, Fast Ethernet link, and speakers. The Docking port also provides the interface to an external DC power source (Battery, AC/DC, etc.).

A view of the ETX Base Board showing the location of the various connectors is provided in Figure 5-30 on page 5-53.

Figure 5-31 on page 5-54 shows a block diagram of the high level functions of the ETX Base Board.

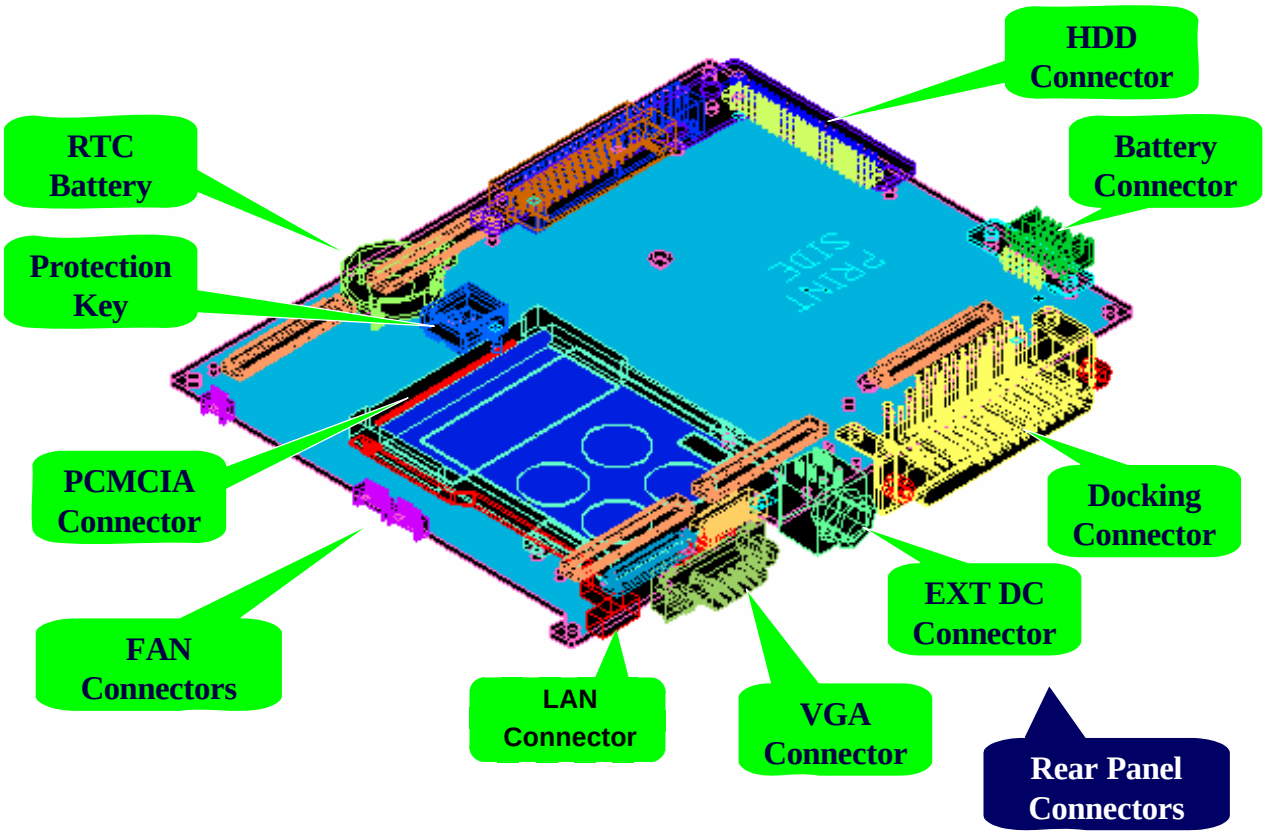


Figure 5-30 ETX Base Board and Connectors

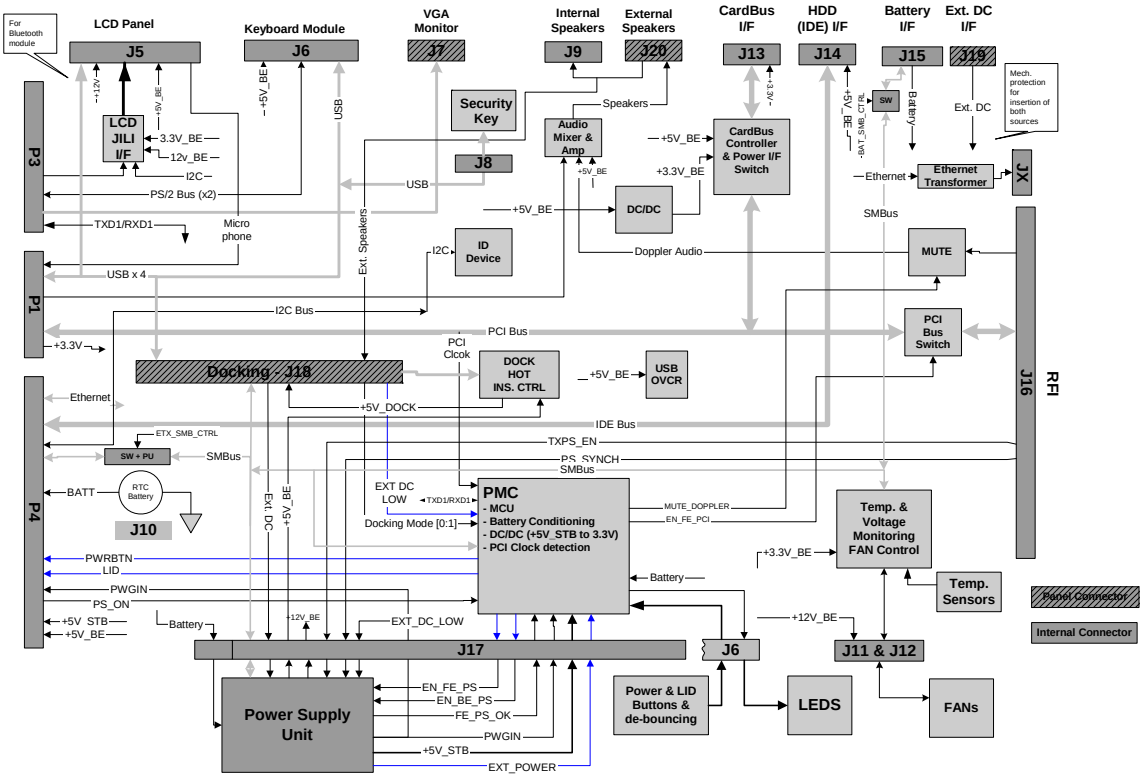


Figure 5-31 ETX Base Board Block Diagram

5-5-3-2 ETX Base Board Layout

This section illustrates the physical aspects of ETX Base Board, providing board layout information as well as information on the board connectors.

For instructions on how the ETX Base Board should be assembled and dis-assembled from the Vivid-i™ system, see *Chapter 8 - Replacement Procedures* - refer to BEP Replacement Procedure on page 8 - 26.

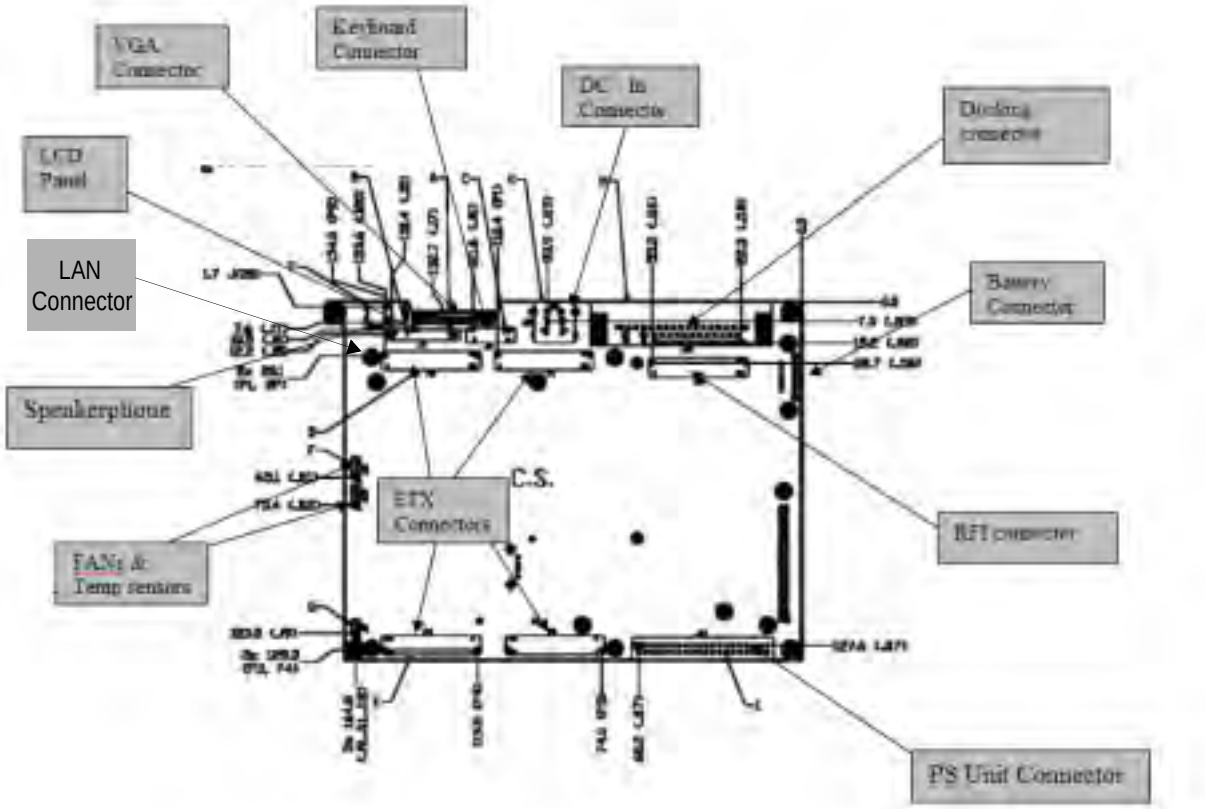


Figure 5-32 ETX Base Board - Components Side

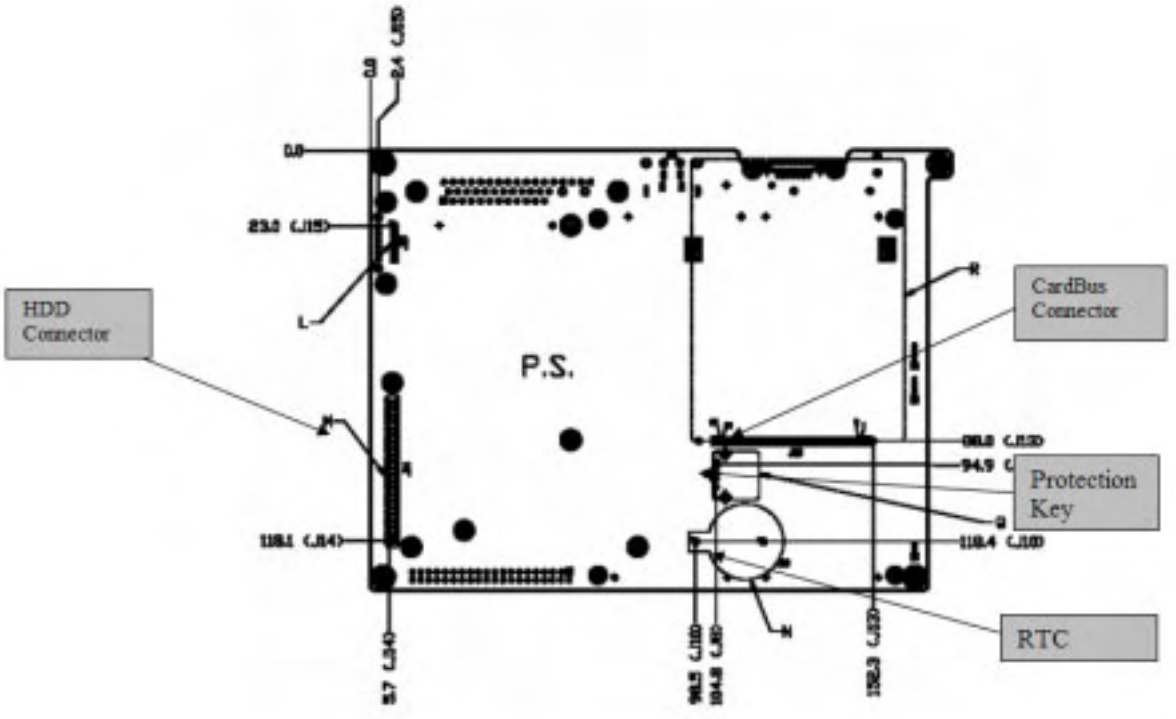


Figure 5-33 ETX Base Board - Print Side

In order to provide maximum ventilation, the component layout does not block the airflow along the system horizontal direction - see Figure 5-34 below.

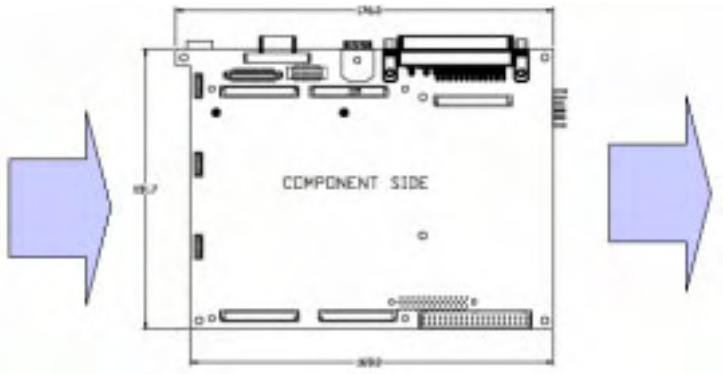


Figure 5-34 Vivid-i™ System Ventilation

5-5-3-3 LCD Interface Block

The interface to the LCD is via the LCD JILI interface, designed to provide the following:

- A generic interface to LCD panels
- Image matrix conversion from 600 x 800 to 1200 x 1600. This is required in order to work with the selected panel's native image size.
- The option to turn ON/OFF the image conversion is provided. This function is supported as part of the JEDA API.
- Backlight illumination control
- Backlight ON/OFF control
- Contrast control
- Supports LVDS interface

On board implementation of the JILI standard includes EEPROM for storing LCD configuration parameters. To configure new LCD device, new parameters can be stored on the EEPROM via the I2C bus.

Backlight intensity is controlled via the JILI interface.

To support various LCD panels, an on-board jumper configuration is used to supply 5V or 3.3V for data and 5V, 3.3V, 12V for backlight.

The interface to the LCD panel is via theJ5 connector

5-5-3-4 Internal Microphone

The internal microphone is located on the LCD panel and routed to P1 of the ETX module via the J5 connector

5-5-3-5 Protection Key

The plug is interfaced to the ETX via a USB port connector J8.

The plug provides a locking mechanism with easy detachment. The plug contains all software options and passwords. The system will not operate properly without the plug.

5-5-3-6 Audio Mixer and Amplifier

The Audio Mixer and Amplifier provide mixing between the ETX speaker OUT signals (SNDR & SNDL) and Doppler audio signals (L & R).

The amplified audio OUT is routed to the external speakers' connector (J20), located on the system rear panel. J20 is also linked to the internal speakers connected to the Base Board via J9.

The amplified audio signals are also connected to the docking connector (J18) to allow connection to higher quality speakers.

In workstation mode, when the FE is powered down, the Doppler audio path is muted in order to prevent noise and saturation of the audio mixer and amplifier. The PMC asserts the DOPPLER_MUTE line for this purpose.

5-5-3-7 CardBus Interface

The PCMCIA slot supports a single type-II or a single type III Card.

The CardBus controller and Power Interface switch supports hot-plug capability.

The maximum current consumption from the ETX' 3.3V is 300mA. Therefore and additional +5V to +3.3V voltage regulator on the Baseboard has been provided on the Base Board to support Cards with power consumption up to 1.6W *(complies with CardBus Specs. for maximum rating).*

5-5-4 BlueTooth Module and Antenna

The BlueTooth Module and Antenna enable the Vivid-i™ portable ultrasound scanner to operate in a wireless LAN network (EchoPac environment), which enables the system to connect to external applications, to save or retrieve data from other network clients.

The BlueTooth module is provided through the upper USB port, using a 3 COM USB-to-Blue Tooth adaptor.

5-5-5 Hard Disk

The Hard Disk is the main storage device of the Vivid-i™ ultrasound unit. The Hard Disk, which is controlled by the CPU via signals from the IDE Bus, is partitioned into four drives, each of which is designated for different operations, as follows:

- **C: Drive:** Execution of the operating system and the software application, and factory presets. The partition size is 2Gbyte.
- **D: Drive:** User presets and data. The partition size is 2Gbyte.
- **E: Drive:** Archiving of all images and reports. The partition size is normally 35Gbyte but this depends upon the size of the hard disk.
- **F: Drive:** Swap file partition for future usage. The partition size is 1Gbyte.

5-5-6 Board ID

A serial EEPROM device, connected to the Host I2C bus, contains the ETX Base Board revision and HW contents, and is read by the host SW.

The built-in logic prevents accidental re-programming of the EEPROM.

5-5-7 Docking Interface

The Docking Interface provides a way in which the Vivid-i™ portable ultrasound scanner may be connected to an external docking device.

The Docking connector (J18) is located on the Vivid-i™ rear panel.

To allow “hot” insertion of the docking station without damaging the power contacts (both going to and coming from the docking unit), the DOCK_HOT_INS_CTRL circuit connects the power to the connector after the connector has been fully inserted.

The signals are routed via the docking interface - refer to the information at the end of this section for more details.

5-5-8 5V_BE to +3.3V_BE Regulator

The 3.3V_BE is required for the following components:

- CardBus controller, power I/F switch & CardBus devices
- PCI bus switch
- MCU (= PMC)
- FAN controller & temp sensing unit
- LCD panel (consumes max 3.8W form the 3.3V)

5-5-9 Monitoring and Fan Control

5-5-9-0-1 Monitoring

The monitoring device is controlled via the SMBus

The device is powered by 3.3V_BE for lower power consumption and to allow direct connection to the 3.3V ETX' SMBus.

The ADT7460 SMBALERT signal is connected to one of the interrupt lines of the PMC for *out-of-limit* indication

5-5-9-0-2 Fan Control

The design is based on Analog Device's ADT7460.

All fans have 3 wires with fan speed control input and actual speed output. Only four fans provide actual output; the fifth fan provides only On/Off information. All fans are powered by +12V.

All five fans operate simultaneously and are controlled via one PWM output on the Fan Controller.

5-5-10 Temperature Control

Provides ambient temperature at six locations inside the system.

On the Base Board, one sensor is located near the air inlet; the second sensor near the air outlet.

All measured temperature values are accessible from the SMBus.

5-5-11 RTC Battery

The RTC battery provides power to the ETX' Real time clock

Type CR-2032

Rating:

- Voltage range: 3.0V- 4.2V
- Max current: 10µA (For ETX-P3E models)
- Max ambient temperature: 80^{o}C
- Expected battery life: 2 years
- The battery life is expected to be >= 5 years.

During shutdown the maximum current drawn from the battery does not exceed 20ma.

For details on the Battery replacement procedure, see Battery Replacement Procedure on page 8 - 3.

5-5-12 Power Management Block

The Power Management block provides the functionality described below.

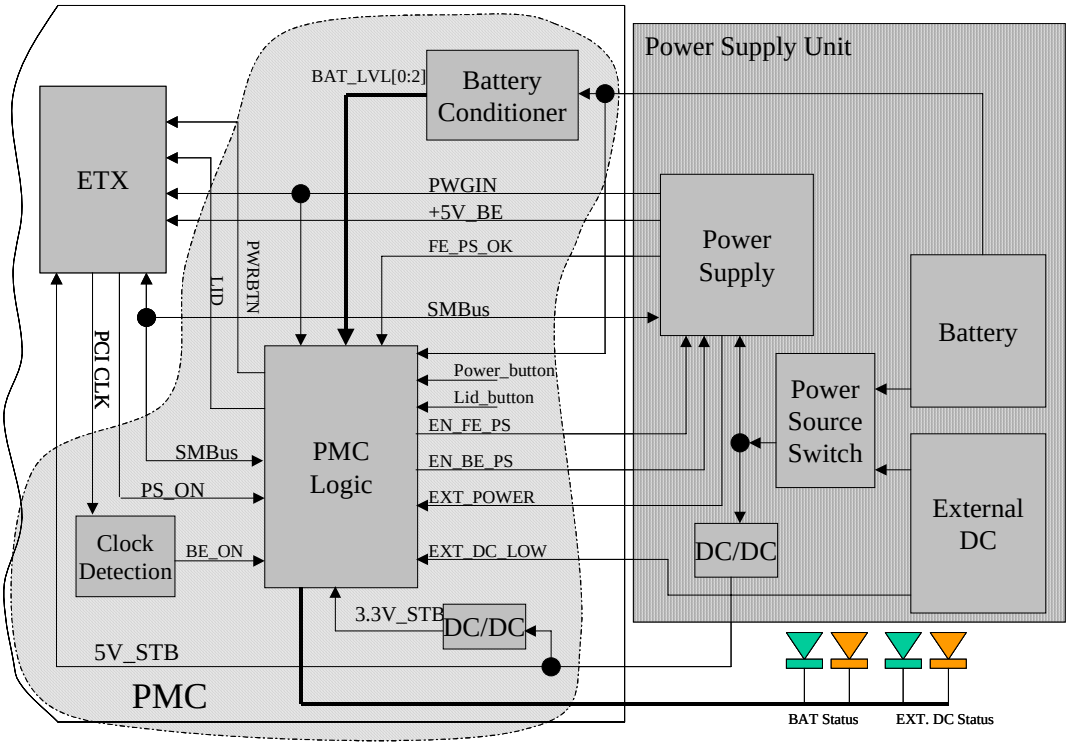


Figure 5-35 Power Control and Conditioning

- **Supports Four Power Modes:**
  - Full performance
  - Workstation mode (FE is powered down)
  - Standby mode
  - Shutdown mode

- **Battery & Ext. DC Status Tracking**

  Battery & external DC power conditioning is supported to prevent powering up the system when the battery is over discharged and can't guaranty normal operation. See Figure 5-36 on page 5-61 for detailed design.

  The PMC compares the battery signal to three fixed levels to decide if the "No Int. Power", "Low Int. Power" or "Normal Int. Power" condition.

  When the EXT_POWER signal is asserted to "0" indicating external power source had been connected, the PMC reads the EXT_DC_LOW line to examine the status of the external source.

- **No_Activity Timer and Shutdown on NAT Timeout**

  Before entering standby mode the host activates the NO_ACTIVITY_TIMER on the PMC to prevent over-discharging of the battery when no AC is applied. In case of timer timeout or battery level too low, the PMC forces the system into shutdown. If AC is being applied, the timer should be cleared and re-activated if AC is disconnected again.

  The NO_ACTIVITY_TIMER period is configurable via the SMBus bus between 0 to 2 hours.

- **HASS Testing**

  For HASS testing, the PMC allows re-cycling the system between full performance mode and shutdown mode. After shutdown, the PMC re-activates the system.

- **Battery and External DC Source Status Indicators Control**

  Two sets of LEDs are provided for the following indications:

  - Battery status -Two LEDS (Green → High, Orange → Low)
  - External DC source status (Green → system is powered from external source)
  - In case both or one of the LEDs is flashing, the system is in standby mode.

- **Suspend Mode Detection**

  When the CPU is forced to switch into suspend mode, the PCI clock is disabled upon successful transition. By activating a TMR_SUSPEND_RESPONSE timer, clearing the BE_ON_DETECTION circuit after time has elapsed and sampling the BE_ON line, it is possible to detect the status of the PCI clock.

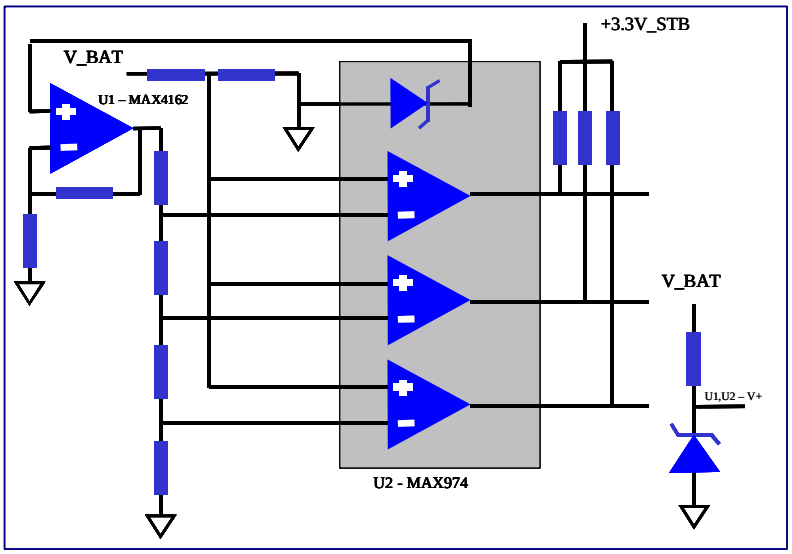


Figure 5-36 Battery Supervisor

- **Back End ON Detection**

  To detect that power to the Back End needs to be turned ON, the PMC clears the detection circuit, activates T_MAX_WAKEUP timer and continues. Next the PMC generates an Interrupt on the BE_ON line indicating a successful transition into active BEP mode. An Interrupt from the timer will provide an indication that power to the BEP needs to be turned OFF.

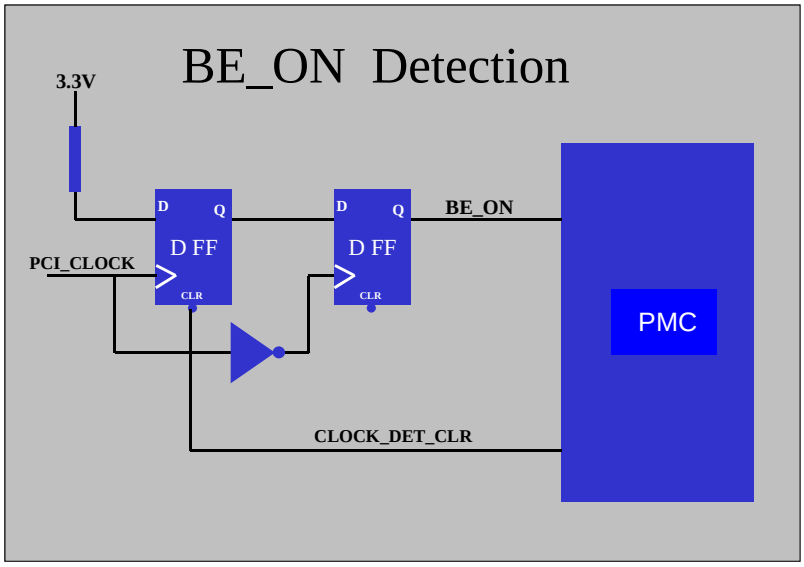


Figure 5-37 Backend ON and Suspend Detection

- **Lid and Power On/Off Buttons**

  Power On/Off Button

  - This is an instantaneous push-button

  Lid On/Off Switch

  - This is a two-position switch (activated by a magnet located in the lid of the system and activated when placed in close proximity of the switch).

- **PMC Circuit**

  The PMC circuit includes the following elements:

  - The microchip unit (MCU) – Microchip's PIC18LF8620
  - The MCU can modify operating clock on-the-fly. The design supports working with two crystals (20Mhz for normal operation and 32.768 kHz).
  - Battery conditioning - three comparators and reference voltage is available to monitor and support battery operation
  - PCI clock detector - the MCU detects when the ETX enters Standby mode. This is implemented by sensing the PCI clock. As long as the PCI clock is present, the ETX has not completed the transition.
  - MCU reset circuit – miniature push-button.

5-5-12-1 Back End External Interfaces

5-5-12-1-1 External Connectors

Table 5-7 External Connectors

Connector #	Description
J7	VGA
J19	EXT DC INPUT
J18	DOCKING
J20	Speakerphones

5-5-12-1-2 Back Panel Connectors

VGA connector

DC In for external DC source (+10V to +20V)

Speakerphones

Docking interface

5-5-12-2 Internal Interfaces

5-5-12-2-1 Internal Connectors

Table 5-8 Internal Connectors

Connector #	Description
J7	VGA
J19	EXT DC INPUT
J18	DOCKING
J20	Speakerphones
J16	RFI
P1:P4[a]	ETX
J5	LCD PANEL
J6	KEYBOARD
J17	PS UNIT
J14	H.D. Adaptor Card
J15	BATTERY
J13	CARDBUS
J10	RTC Battery
J8	Protection Key
J11:J12	FANS
J9	Speakers

a. All connections to P1, P2, P3 and P4 according to ETX specs.

5-5-12-2-2 RFI Connector

NOTE: The PCI signals on the RFI connector were assigned to matched the counterpart signals on the ETX' P1 connector.

5-5-12-2-3 Display Connectors

Table 5-9 Display Connectors

Pin #	Signal Name	Description
1	FG	Frame Ground
2	GND	Ground
3	VDD	+3.3V Power Supply
4	VDD	+3.3V Power Supply
5	VEEDID	EEDID +3.3V Power Supply
6	Reserved	Reserved
7	CLKEEDID	EEDID Clock
8	DATAEEDID	EEDID Data
9	ReIN0-	Negative LVDS differential data input (Even R0-R5, G0)
10	ReIN0+	Positive LVDS differential data input (Even R0-R5, G0)
11	GND	Ground
12	ReIN1-	Negative LVDS differential data input (Even G1-G5, B0-B1)
13	ReIN1+	Positive LVDS differential data input (Even G1-G5, B0-B1)
14	GND	Ground
15	ReIN2-	Negative LVDS differential data input (Even B2-B5, HSYNC, VSYNC, DSPTMG)
16	ReIN2+	Positive LVDS differential data input (Even B2-B5, HSYNC, VSYNC, DSPTMG)
17	GND	Ground
18	ReCLKIN-	Negative LVDS differential clock input (Even)
19	ReCLKIN+	Positive LVDS differential clock input (Even)
20	GND	Ground
21	RoIN0-	Negative LVDS differential data input (Odd R02-R5, G0)
22	RoIN0+	Positive LVDS differential data input (Odd R02-R5, G0)
23	GND	Ground
24	RoIN1-	Negative LVDS differential data input (Odd G1-G5, B0-B1)
25	RoIN1+	Positive LVDS differential data input (Odd G1-G5, B0-B1)
26	GND	Ground
27	RoIN2-	Negative LVDS differential data input (Odd B2-B5)
28	RoIN2+	Positive LVDS differential data input (Odd B2-B5)
29	GND	Ground
30	ReCLKIN-	Negative LVDS differential clock input (Odd)

Table 5-9 Display Connectors (Continued)

Pin #	Signal Name	Description
31	ReCLKIN+	Positive LVDS differential clock input (Odd)
32	FG	Frame Ground
33	GND	Ground
34	USB D+	
35	USB D-	
36	+5V_BE	USB supply
37	GND	Ground
38	Microphone	
39	+12V_BE	CFL Inverter supply
40	CFL Control	Backlight control
41	GND	Ground

5-5-12-2-4 Battery Connectors

Table 5-10 Battery Connectors

Pin #	Signal Name	Description	Comments
1	GND	Ground	
2	GND	Ground	
3	Thermistor		Not in use
4	SMB Clock		
5	SMB Data		
6	Battery (14.8V)		
7	Battery (14.8V)		
8	Battery (14.8V)		
9	Battery (14.8V)		
10	GND	Ground	

5-5-12-2-5 Power Supply Unit Connector

Table 5-11 Power Supply Unit Connectors

Pin #	Signal Name	Description	Comments
1	EXT_DC		
2	EXT_DC		
3	EXT_DC		
4	EXT_DC		
5	EXT_DC		
6	GND	Ground	
7	GND	Ground	
8	GND	Ground	
9	GND	Ground	
10	GND	Ground	
11	BATERRY		
12	BATERRY		
13	BATERRY		
14	BATERRY		
15	GND	Ground	
16	GND	Ground	
17	GND	Ground	
18	GND	Ground	

Table 5-11 Power Supply Unit Connectors(Continued)

Pin #	Signal Name	Description	Comments
19	+12V_BE		
20	5V_STB		
21	+5V_BE		
22	+5V_BE		
23	+5V_BE		
24	+5V_BE		
25	GND	Ground	
26	GND	Ground	
27	GND	Ground	
28	PWGIN		PWR_OK [0]
29	FE_PS_OK		PWR_OK [1]
30	EXT_DC_LOW		
31	TXPS_EN		THV_ON/OFF
32	EN_BE_PS		TOTAL_PWR_DWN
33	PS_SYNCH		EXT_SYNC
34	GND	Ground	
35	TEMP_SENS		
36	GND		
37	SMB_CLK		
38	SMB_DATA		
39	EN_FE_PS		FE_PWR_DWN
40	EXT_POWER		EXT_SRC_TYPE

5-5-12-2-6 Fan Connectors

Each connector is connected to two FANS according to the information in Table 5-12 below.

Table 5-12 Fan Connectors

Pin #	Signal Name	Description	Comments
1	+12V_BE		
2	PWM		
3	TACH1		
4	TACH2		
5			
6			

5-5-12-2-7 Keyboard Interface

Table 5-13 Keyboard Connectors

Pin #	Signal Name	Description
1	USB_D+	
2	USB_D-	
3	GND	Ground
4	PS/2_TRB_CLK	Trackball clock
5	PS/2_TRB_DAT	Trackball data
6	PS/2_KBD_CLK	AN keyboard clock
7	PS/2_KBD_DAT	AN keyboard data
8	PWR_BTN	Power button
9	LID_SW	Lid switch
10	STAT_BAT_ GR	Battery status LED (green)
11	STAT_BAT_ YE	Battery status LED (yellow)
12	STAT_EXT_DC_ GR	External DC status LED (green)
13	STAT_EXT_DC_ YE	External DC status LED (yellow)
14	+5V_BE	
15	GND	Ground

NOTE: HDD interface uses IDE connector in accordance with IDE specifications.

5-5-12-2-8 Protection Key Interface

Table 5-14 Protection Key Connectors

Pin #	Signal Name	Description
1	+5V_BE	+5V DC
2	D-	Data -
3	D+	Data +
4	GND	Ground

5-5-12-2-9 VGA Connector

According to standard 15 pins VGA connector.

5-5-12-2-10 Internal Speakers

Table 5-15 Internal Speaker Connectors

Pin #	Signal Name	Description
1	L_SPKR +	
2	L_SPKR -	
3	R_SPKR +	
4	R_SPKR -	

5-5-12-2-11 External Speakers

Table 5-16 External Speaker Connectors

Pin #	Signal Name	Description
1	Common	
2	L_SPKR_IN	L signal from audio amp.
3	R_SPKR_IN	R signal from audio amp.
4	L_SPKR_OUT	L signal to Internal speaker
5	R_SPKR_OUT	R signal to Internal speaker

5-5-12-2-12 External DC

Table 5-17 External DC Connectors

Pin #	Signal Name	Description
1	EXT DC In	
2	EXT DC In	
3	GND	Ground
4	GND	Ground

5-5-12-3 Base Board Buses

5-5-12-3-1 I2C Bus

According to ETX specs this bus is +5V

The ETX is the only I2C master

Two devices are connected to the bus:

- ETX Baseboard ID device
- JILI EEPROM for LCD mode control

5-5-12-3-2 SM Bus

According to ETX specs this bus is +3.3V

The ETX function only as SMBus master

There may be other masters on the BUS (e.g. PS, battery and RFI)

ADT7460 device

- FANS controller
- Ambient temperatures at six locations within the system
- Measurement of DC voltages - (High voltage and Low voltage).

5-5-12-3-3 PCI Bus

All PCI signals are 3.3V

No terminations are required on any of the PCI data/address lines

No pull-up resistors are required on any of the PCI control lines. All pull-ups are connected on the ETX module.

The RFI interfaces to the ETX PCI bus by means of a bus switch acting as an isolator when the Front-End is powered down. The host controls this device by sending a command to the PMC.

The CardBus module is connected to the PCI bus through a PCI-to-CardBus bridge. The bridge supports not more than one card.

Hot swap is supported

5-5-13 15" LCD Monitor

5-5-13-1 Introduction

The Vivid-i™ 15" LCD Monitor incorporates improved LCD technology, has a power consumption of less than 8W, provides a wide viewing angle, and features enhanced contrast capabilities.

Section 5-6
Power Supply Unit

5-6-1 Introduction

The Power Supply (PS) Unit provides the Vivid-i™ system with both Low Voltage and High Voltage power, and also enables recharging of the battery.

The PS Unit controls eight main functions, as follows:

- Input switching stage – selects between the external DC source or internal battery
- Back End Low Voltage power supply (LVPS)
- Standby power supply
- Front End Low Voltage power supply (LVPS)
- Front End High Voltage power supply (HVPS)
- Battery charger
- PS ON/OFF control
- Micro controller and circuitry (used for monitoring, charger control and additional auxiliary functions).
  The PS communicates with the host CPU via the SMBus.

A block diagram of the high-level functions and power distribution implemented by the PS Unit is provided in Figure 5-39 below.

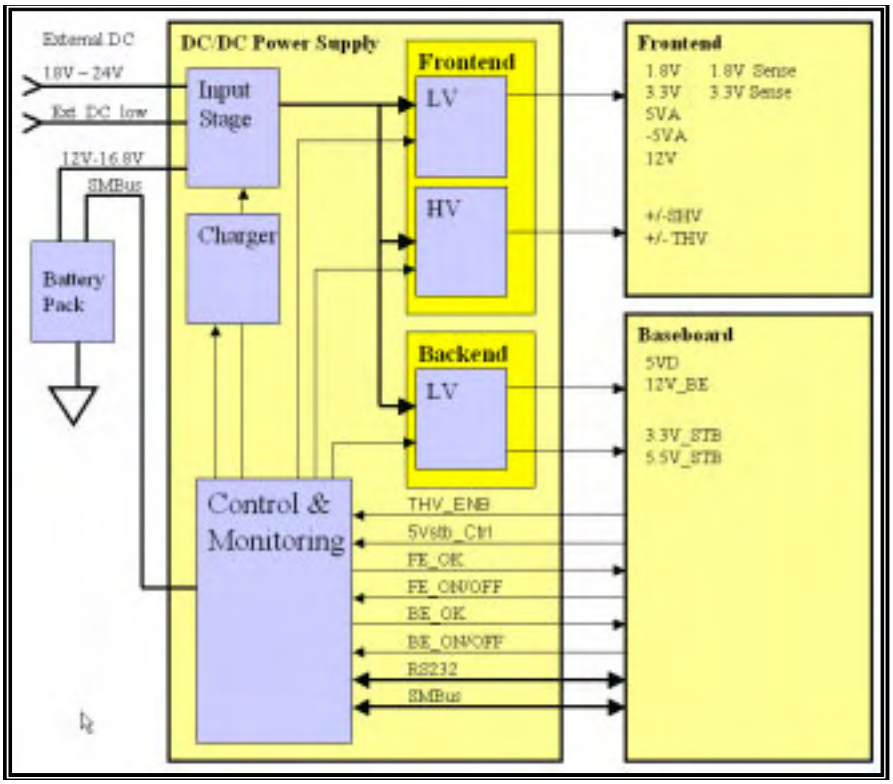


Figure 5-38 Vivid-i™ Power Supply - Block Diagram and Power Distribution

5-6-2 PS Unit Components

As shown in Figure 5-39, the PS Unit comprises the following components, each of which is described below:

- Rechargeable Battery
- PS Controller and Monitor
- DC Source Selector
- Battery Charger
- High Voltage Power Supply (HVPS)
- Low Voltage Power Supply (LVPS)

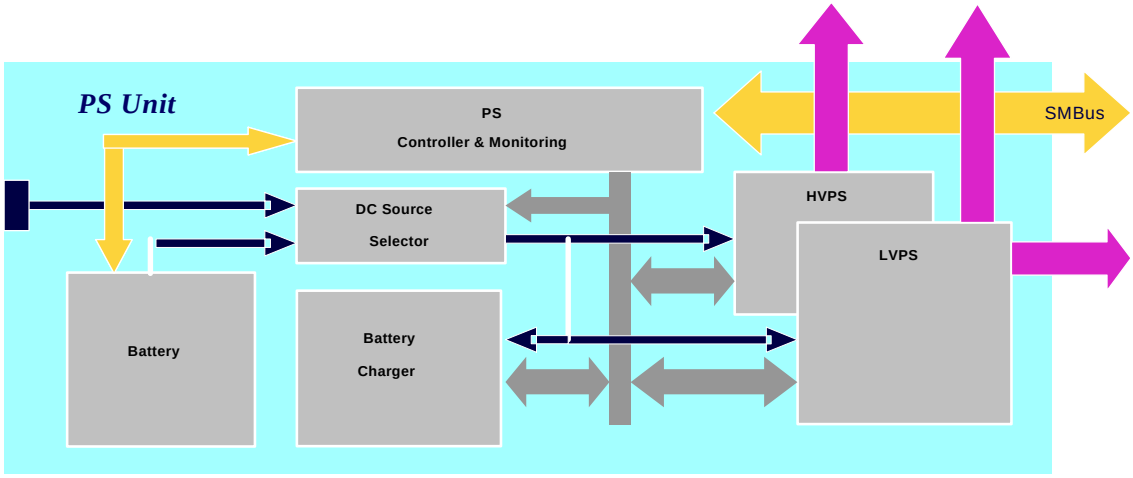


Figure 5-39 Vivid-i™ Power Supply Unit Components - Block Diagram

5-6-3 General Specifications and Requirements

Parameter	Min	Typical	Max.	Units
Input voltage range	12		21	VDC
Battery current drain at shutdown state			2	mA
Hold-up time	10			Ms
Total power (output)		100		W
Efficiency	85	88		%

The PS module is powered either by an internal Lithium Ion battery pack or by an external DC source (for example, an external AC-DC or an external battery pack).

The Back End and Front End power supplies are separately controlled using control lines. The appropriate status signal changes state when all the voltages in each PS complete the transition.

The PS Unit is located inside the Vivid-i™ system and shielded by the external case, therefore an EMC shielding is not required. However, to guarantee noise-free operation of the system in all scanning modes in general, and in Doppler mode in particular, a special shielding has been implemented.

The PS Unit has been designed to provide maximum efficiency when operated on batteries.

5-6-4 Power Management

5-6-4-1 Power Operating Modes

The PS unit supports the following operation modes:

Mode	Description
Shut Down	• Frontend is OFF • BEP is OFF. Only the PMC is working (powered by 3.3V_STB [less than 2ma]) • In case an external DC is applied, the PS should be powered and the charger should be activated (unless the battery is fully charged) in all modes except *Scanning* to avoid noise introduction during battery charging.
Standby	• The BEP is in standby mode.
Workstation	• Only Frontend is ON
Scanning	• Both BE & Frontend are ON

5-6-4-2 Critical Temperature Sensor

The PS Unit includes a temperature sensor that will shutdown the DC-DC power supply if a critical temperature of 90 degrees is reached inside the PS. After the temperature settles down the PS will enable the DC-DC operation.

5-6-4-3 Control & Monitoring

The host is able to read the value of each PS voltage and current.

The THV average transmitted power should be read back by the PMC.

The THV is fully controlled by the host (ON/OFF and value setting)

Watchdog timer value is programmable by the host.

5-6-5 Monitoring

The Monitoring is designed to monitor all power supplied to the system and, in the event that safety upper limits are reached, turns OFF power. See specifications below.

5-6-6 DC Output Specifications

Table 5-18 DC Output Specifications

Output	Nominal Output Voltage [V]	Range
+1.8V	1.8	± 10%
+3.3V	3.3	± 10%
+5Va	5	± 10%
-5Va	-5	± 10%
+12V	12	± 10%
±THV	± 2 - ± 70	± 10%
±SHV	± 80	± 10%
3.3Vstb	3.3	± 10%
5Vstb	+5	± 10%
5Vd	+5	± 10%
12V_BE	12	± 10%

5-6-7 DC Source Selector

This circuitry selects the source of the power. When the AC DC converter input into the system is higher than 18V, the system will be powered by the AC DC converter. Otherwise, the selector will look for an alternative power source (the battery), expecting to receive between 16 and 12V DC.

5-6-8 Low Voltage Power Supply (LPVS)

5-6-8-1 LVPS Output Specifications

LVPS LOAD

The output voltage does not exceed +/- 10% from the specification when load is below minimum.

Maximum delay between all outputs does not exceed 200 ms.

The +3.3V supply is always lower than the +5Vd supply in all operation conditions including transitions.

LVPS Current limit switches power OFF if overload condition occurs on any of the +3.3, +5Va, +5Vd, +12V, and +1.8 V outputs.

5-6-9 High Voltage Power Supply (HPVS)

5-6-9-1 HVPS Output Specifications

The HVPS generates two symmetrical pairs of high voltages:

- +/-THV voltages used by the transmitters.
  The range of the +/-THV is +/-10V to +/-70V and is digitally controlled by the uC.
- +/-SHV voltage used by the high voltage analog multiplexers.
  This is always 18V higher than +/-THV.

During turn on time +/-THV should be turned OFF.

The high voltages should have a protection from shorts and opposite polarity pull.

The current limit circuitry should switch power OFF if overload condition (20% higher than max load) occurs on the -/+SHV or -/+THV outputs.

The +/- THV should never be larger then the +/-SHV in all operation conditions including transitions

When there is a loss of communication between the THV and the BEP, a watchdog (which is implemented inside the THV) will disable the THV within 2 seconds. In the event that communication is re-gained, the THV will be enabled and the system will resume transmission.

The THV is disabled when the TXPS_EN signal coming from the Front End is low. This is done to guarantee that the THV will not generate any power when this signal is accidentally disconnected. This is implemented by a pull-down resistor on this signal.

5-6-10 Rechargeable Battery

The lithium ion rechargeable battery provides power to the Vivid-i™ system whenever an AC power source is not available. The system is supplied with a lithium ion rechargeable battery installed in the battery bay, as standard.

A fully-charged battery should be capable of powering the system for a minimum of 1 hour. (Lithium ion batteries last longer than conventional batteries and therefore do not require replacement as frequently).

Note: The lithium ion technology used in the system's battery is significantly less hazardous to the environment than the lithium metal technology used in some other batteries (such as, watch batteries).

CAUTION: The battery is designed to work with Marlin systems *only*. Only use the batteries authorized by GE Medical Systems.

WARNING: Used batteries should not be placed with common household waste products. Contact your local authority for the location of a chemical waste collection program nearest to you.

WARNING: Always adhere to the following battery safety precautions:

- The battery has a built-in safety device. ***Do not disassemble or alter the battery!***
- Charge batteries only when the ambient temperature is between 0° and 65° C (32° and 149° F) and discharge the batteries between -10° and 55° C (14° and 131° F).
- Do not short-circuit the battery by directly connecting the negative terminals with metal objects.
- Do not heat the battery or discard it in a fire.
- Do not expose the battery to temperatures over 60° C (140° F). Keep it away from fire and other heat sources.
- Do not charge the battery near a heat source, such as a fire or heater.
- Do not leave the battery in direct sunlight.
- Do not pierce the battery with a sharp object, hit it, or step on it.
- Do not use a damaged battery.
- Do not solder a battery.
- Do not connect the battery directly to an electrical power outlet.

Note: If the Vivid-i™ portable ultrasound scanner is not being used for periods of one month or longer, the battery should be removed from the system.

CAUTION: To prevent the battery bursting, igniting, or fumes from the battery causing equipment damage, observe the following precautions:

- Do not immerse the battery in water or allow it to get wet.
- Do not place the battery into a microwave oven or pressurized container.
- If the battery leaks or emits an odor, remove it from all possible flammable sources.
- If the battery emits an odor or heat, is deformed or discolored, or in a way appears abnormal during use, recharging or storage, immediately remove it and stop using it. If you have any questions about the battery, consult your local GE Medical Systems representative.
- Use only batteries approved by GE Medical Systems and observe the following conditions for storage:
  - Short term (less than 1 month): - between 0° C (32°F) and 50° C (122°F)
  - Long term (more than 3 months): - between 10° C (50° F) and 35° C (95°F).

5-6-10-1 Battery Calibration Wizard

The Battery Calibration Wizard is a tool available on the system to provide the user with good control over and feedback regarding the following (described below):

- General state of the battery - aging and calibration
- Charging and re-calibrating the battery by the system (not only through the external charger)

5-6-10-1-1 Battery Recalibration / Aging Status

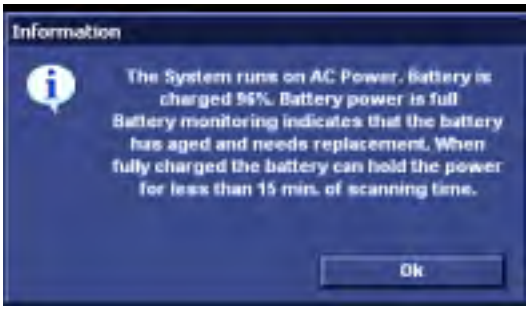
In the lower *right* corner of the screen, a battery status message is displayed. When the battery is in need of re-calibration, an additional message appears, as follows:

The System runs on AC Power. Battery is charged 99%. Battery power is full
Battery monitoring indicates a recommendation to perform calibration in order to maintain prolonged battery life.
Battery re-calibration may take several hours.
Recalibrate
Ignore

Note: If the battery is calibrated, the message is not displayed.

Note: For more details, refer to Battery Calibration on page 6 - 4.

In the event that the battery has aged and has reached a point where remaining power when *Full* does not allow more than approx. 15 minutes of scanning time, an additional message will be displayed, as follows:


Information
The System runs on AC Power. Battery is charged 96%. Battery power is full
Battery monitoring indicates that the battery has aged and needs replacement. When fully charged the battery can hold the power for less than 15 min. of scanning time.
Ok

Note: This notification will be raised by the application in accordance with simple measurement of the cycles of work.

5-6-10-1-2 Battery Recalibration on the System

If the status message box indicates that re-calibration is required, two additional buttons: **Recalibrate** and **Ignore** will be displayed which may be used to control operation of the special Calibration "Wizard". When activated, they will evoke the opening of the first page of the wizard-type display, showing an overview of the whole recalibration process, and providing a clear explanation of the first step to be performed. A **Next** button will appear at the bottom of the screen.

Note: In order to avoid mis-use of this functionality when it is not required, these additional buttons will be hidden when there is no need for recalibration.

When the **Recalibrate** button is pressed, the application will be closed and a new application will be activated to run the Calibration Wizard.

Note: For step-by-step instructions, refer to Battery Calibration on page 6 - 4.

5-6-11 Battery Charger

5-6-11-1 Introduction

The system is provided with an internal and an optional external battery charger.

The internal Battery Charger is capable of charging the battery pack with up to 0.5C (~3.3A) while keeping the overall dissipated power below a rated power. The charging rate is controlled based on keeping the current capacity of AC adapter.

The Battery Charger is used to charge the lithium-Ion battery pack that is composed of 12 cells of lithium battery (18650) arranged in three parallel groups of 4 serially connected cells.

The Battery Charger is in compliance with Level 2 of Smart battery Charger Specification Revision 2.0.

Battery Charger specifications are listed in Table 5-19 below.

Table 5-19 Battery Charger Specifications

Description	Minimum	Nominal	Maximum
Output Voltage	12V	14.4V	16.8V
Charging Current		N/A	0.5C (~3.3A)
Charger Efficiency	93%	95%	96%
Temperature - Charge	0°C		45°C
Temperature - Discharge	-20°C		60°C
Temperature - Storage	-20°C		60°C

Charging Condition:

- Method: Constant Voltage and Constant Current Method
- Voltage: 4.2+/–0.05V /cell
- Current: 0.1A/cell ~ 1.1A/cell (C/5~0.5C)

The PS controller guarantees that under all load and battery conditions the total power consumed by both the charger and the loads is within the maximum rated power of the unit. When the battery is fully loaded the charger is disabled and powered-down to reduce any internal power dissipation.

5-6-11-2 Recalibration

The fuel gauge in the battery uses a highly accurate voltmeter, ammeter and time clock to measure actual charge in and out of the battery pack. In addition, algorithms are built into the smart-battery circuitry to compensate for the effects of discharge rate, discharge temperature, self-discharge and charging efficiency, *etc.*

All these factors combine to provide a highly accurate fuel gauging system. What is also required is the means to ensure the continued reliability of this system throughout the life of the battery pack.

Also, as the battery ages, the amount of available capacity shrinks - like a car with a fuel tank that shrinks as it gets older - so each cycle, the "full" point gets a little bit lower.

After a period of time, if the actual capacity of the battery is below 40% of the designed full capacity, it is recommended to replace the battery. When the condition of the battery reaches this stage it is visibly noticeable that it does not hold its charge for long periods. On newer Vivid-i™ systems, this is also indicated under *Diagnostics* - refer to Figure 7-70 on page 7-104.

Moreover, if the battery is partially charged and discharged during its application, the battery circuitry will not detect the true "full" or "empty" reference point and the fuel gauging system may be subject to drift during use.

When the battery detects a drift of >10%, it will set up a flag inside the battery circuitry to warn that it is necessary to recalibrate the battery. On plugging the battery into the battery bay, the external Charger unit uses the recalibration bit to tell the user if recalibration is necessary and flashes the red LED if the battery fuel gauge is becoming inaccurate.
For procedure instructions, refer to Battery Recalibration on page 3 - 47.

Therefore, the recalibration is used to re-set the fuel gauge algorithms, re-establish the full and empty points, and recalculate the actual capacity in the battery. In this way, even as the battery ages, the accuracy and reliability of the fuel gauge can be retained throughout the life of the battery.

Note: The most common cause of calibration failure is overheating of the pack during discharge. For this reason, keep the charger away from direct sunlight or heat sources.

Section 5-7
Keyboard and Control Panel

5-7-1 Keyboard and Control Panel Layout

Figure 5-40 below illustrates the layout of the Vivid-i™ keyboard and control panel**.** The buttons and controls are grouped together for ease of use; the different areas of the keyboard and control panel include the following:

- Soft menu Keys – part of the Extended Keyboard
- TGC
- GAIN rotary
- Alphanumeric KB
- Extended KB
- Trackball
- Trackball buttons
- Front panel
- Hand-rest area of front-panel

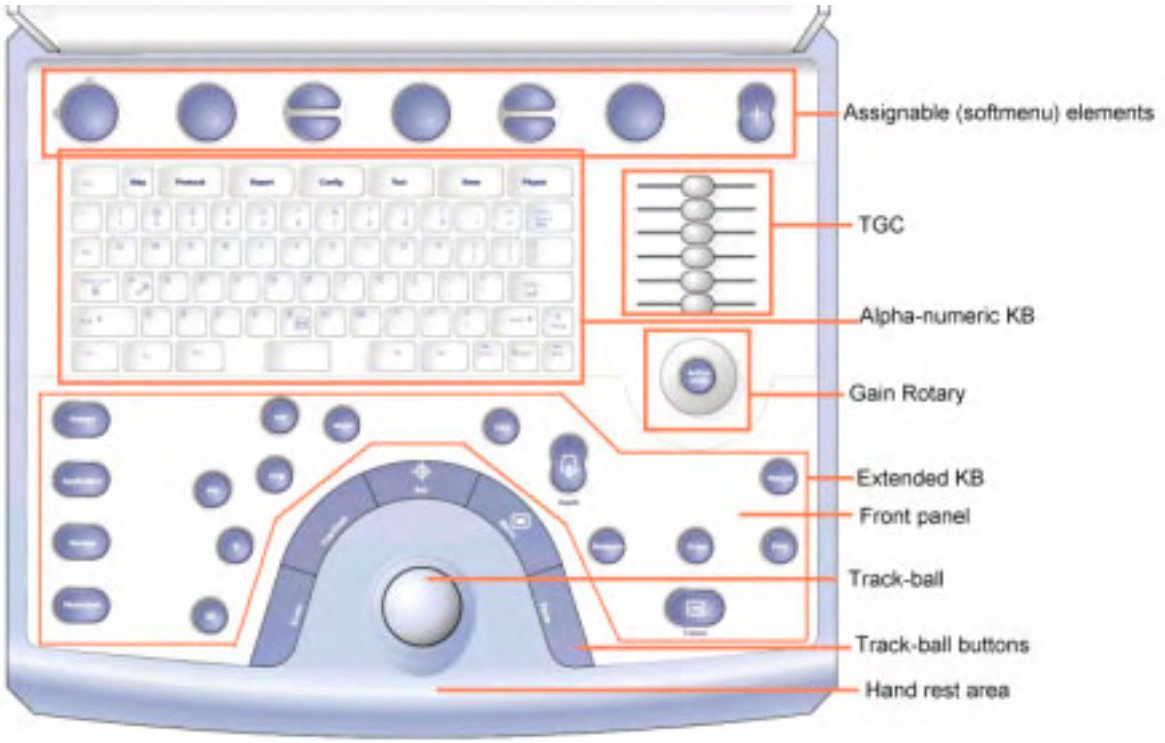


Figure 5-40 Vivid-i™ Keyboard and Control Panel Layout

The Vivid-i™ keyboard unit comprises the main user-interactive devices: an alphanumeric keyboard, a 1.5" trackball, and an Extended keyboard. In addition, it includes one or more printed circuit boards (PCBs) designed to carry the various electronic components - these include the keyboards' controller, TGC potentiometers, USB Hub, and backlight illumination.

Figure 5-41 below shows a high-level functional block diagram of the keyboard unit. The individual components are described in the *Keyboard and Control Panel Components* section, page 5-86.

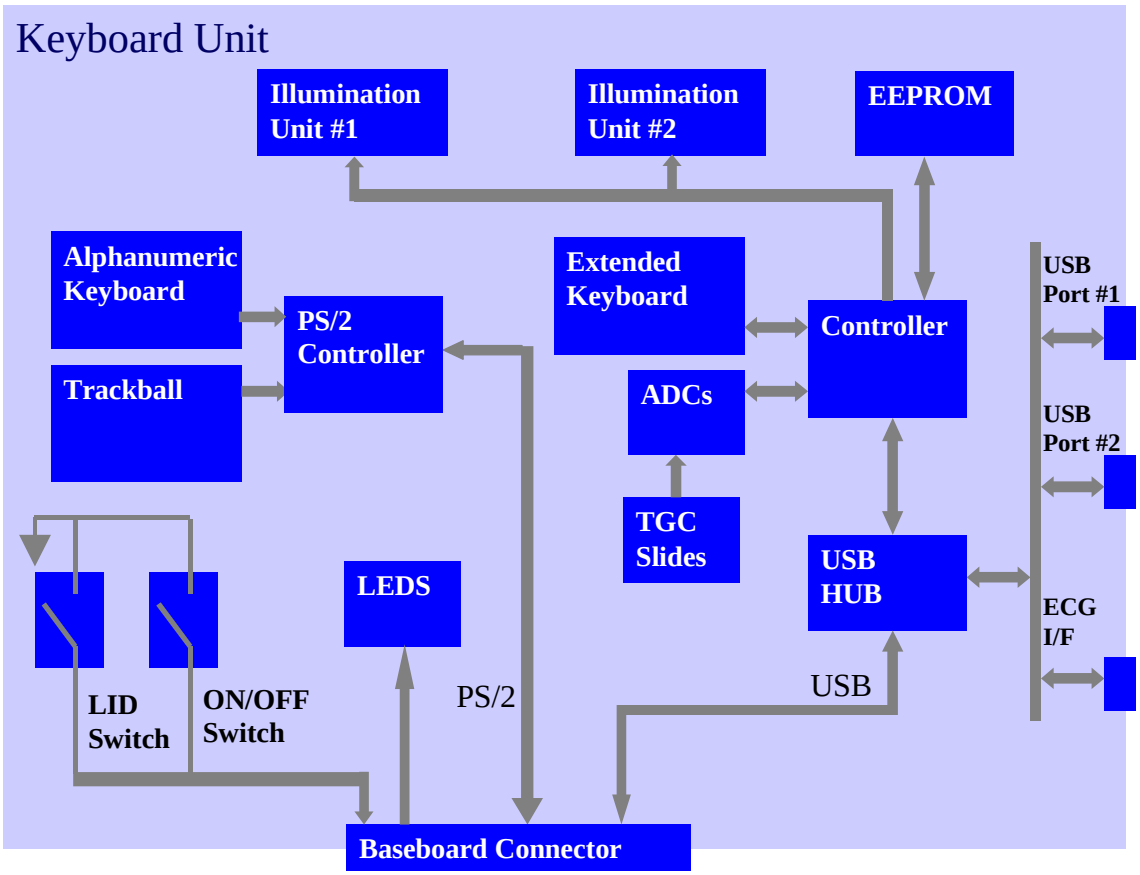


Figure 5-41 Vivid-i™ Keyboard Block Diagram

5-7-2 Keyboard and Control Panel Components

5-7-2-1 Power ON/OFF Button

The Power On/Off button receives 3.3V from the BEP. Once shorted, this voltage is routed to the PMC which will activate or perform the appropriate task, as required.

5-7-2-2 Lid ON/OFF Switch

The Lid On/Off switch is activated by a magnet located in the LCD frame (on the left side). Once the lid of the Vivid-i™ system is closed completely, the magnet is positioned above the lid switch which causes the contacts of the switch to short at 3.3V to the PMC. The 3.3V is generated by the BEP.

5-7-2-3 Alphanumeric Keyboard

The Vivid-i™ alphanumeric keyboard, with a key arrangement similar to that of a laptop keyboard, is based on the global GE International standard keyboard requirements.

The alphanumeric keyboard has a PS/2 interface and supports all standard alpha-numeric functionality, such as, auto-repeat, standard ASCII output codes, *etc*.

Specially designed, high-quality key caps - together with controllable backlighting - provide a keyboard that is comfortable and easy to use.

The upper row of functional keys (F1 - F11), are clearly identified as being assigned to specific ultrasound functions.

5-7-2-4 TGC Sliders

There are six linear Time Gain Compensation (TGC) sliders located to the right of the alphanumeric keyboard (refer to Figure 5-40 on page 5-84).

These keys, that slide horizontally, are used to compensate for depth-related attenuation in an image.

5-7-2-5 Gain Rotary

The Gain Rotary (located below the TGC Sliders - see Figure 5-40 on page 5-84) has a push button at its center. This is used to toggle between *Active* and *Inactive* mode,

5-7-2-6 Extended Keyboard

The Extended keyboard (see Figure 5-40 on page 5-84) is the ultrasound- specific keyboard which is used to activate the ultrasound system. This keyboard is controlled via the USB hub located on the keyboard PCB.

5-7-2-7 Trackball

The Vivid-i™ control panel has a 1.5” trackball centrally located above the hand-rest area to provide easy operation - see Figure 5-40 on page 5-84.

The trackball has a PS/2 interface and supports a variety of basic PC operations and specific ultrasound controls.

5-7-2-7-1 Trackball Buttons

The buttons surrounding the Trackball (defined as Trackball buttons) can be divided into two groups:

- **Set and Menu Buttons**

  These are equivalent to the normal PC mouse left and right click (**Set** = left-click; **Menu** = right-click). The operation of these buttons is supported via the PS/2 board.

- **Zoom, Trackball, and Store Buttons**

  These buttons, even though located beside the trackball, are part of the External Keyboard buttons and not part of the Alphanumerical or regular trackball buttons. The operation of these buttons is supported via the USB hub located on the keyboard.

5-7-2-8 Key and Backlight Illumination

The keys on the control panel are illuminated according to their availability, as follows:

- **Green** - key function is currently *active*.
- **White** - key function is *available* (but not active) in the currently-selected scanning mode and/or options enabled.
- **No illumination** - key is *not available* in the currently-selected scanning mode and/or options enabled.

Three separate backlight illumination functions are provided:

- **On the Alphanumeric Keyboard:**

  The complete alphanumeric keyboard has backlit illumination which is controlled by commands coming from the BEP via the USB Hub.

- **On the Extended Keyboard**:

  Each key on the extended keyboard has its own backlight illumination which is controlled by the BEP via the USB Hub. Available keys are illuminated.

- **Active Key Backlight**:

  Keys which have an On/Off position (enabled/disabled) are illuminated with a green backlight to inform a user that of the current state.

5-7-2-9 USB Hub

The USB hub drives the following devices:

- Keyboard controller
- External ECG unit (~100 mA)
- Two general purpose ports
  (current up to 500 mA per port, over-current limit should be used).

5-7-2-10 Power Interface

Power to the keyboard is provided via the ETX baseboard +5V.

The overall keyboard module consumes below 500 mA (not including USB ports).

The board operates with ±5% voltage deviation on each supply.

The board has current limiting circuitry (implemented on the BEP), to protect it against excessive current consumption via the USB and short circuit.

5-7-2-11 Keyboard ID

The keyboard PCB contains an EEPROM which stores a variety of information about the keyboard such as, GE part no, manufacturing date, and revision # of the PCB hardware.

The EEPROM size is 1KB.

5-7-2-12 Connectors

The keyboard module is connected to the ETX Base Board. For detailed pins see Table 5-20 below.

Table 5-20 Keyboard Module Connectors

Connector #	Signal Name	Pin #	Type	Source/ Destination	Description
P1	USB_D+	1	I/O	BEP	
P1	USB_D-	2	I/O	BEP	
P1	GND	3	I	BEP	
P1	PS/2_TRB_CLK	4	I	BEP	Trackball clock
P1	PS/2_TRB_DAT	5	I/O	BEP	Trackball data
P1	PS/2_KBD_CLK	6	I	BEP	AN keyboard clock
P1	PS/2_KBD_DAT	7	I/O	BEP	AN keyboard data
P1	PWR_BTN	8	O	PMC	Power button
P1	LID_SW	9	O	PMC	Lid switch
P1	STAT_BAT_ GR	10	I	PMC	Battery status LED (green)
P1	STAT_BAT_ YE	11	I	PMC	Battery status LED (yellow)
P1	STAT_EXT_DC_ GR	12	I	PMC	External DC status LED (green)
P1	STAT_EXT_DC_ YE	13	I	PMC	External DC status LED (yellow)
P1	+5V	14	I	BEP	
P1	GND	15	I	BEP	

5-7-3 ECG Module

5-7-3-1 Overview

The Vivid-i™ ECG Patient I/O module is designed to enable acquisition of the following signals: ECG, and external ECG. The different pins on the ECG input connector are specifically assigned to support either External ECG or Internal ECG. The Internal ECG module supports acquisition of three bipolar ECG channels: leads I, II, III. The External ECG module supports acquisition of a single bipolar ECG input channel ranging from -1 to +1 volt allowing amplification of 1000. The minimal allowed impedance is 10 M ohm.

The ECG module is mounted on the keyboard PCB. All power and communication is supplied to the ECG module via and by the keyboard PCB, using the USB Hub as shown in Figure 5-42 below.

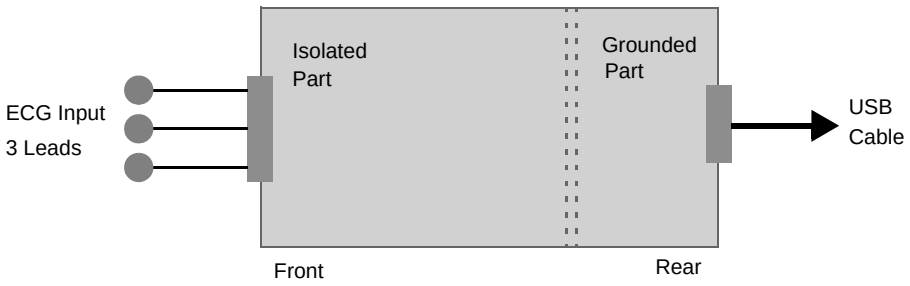


Figure 5-42 ECG Patient I/O Module

A general block diagram of the ECG Patient I/O Module is shown in Figure 5-43 below.

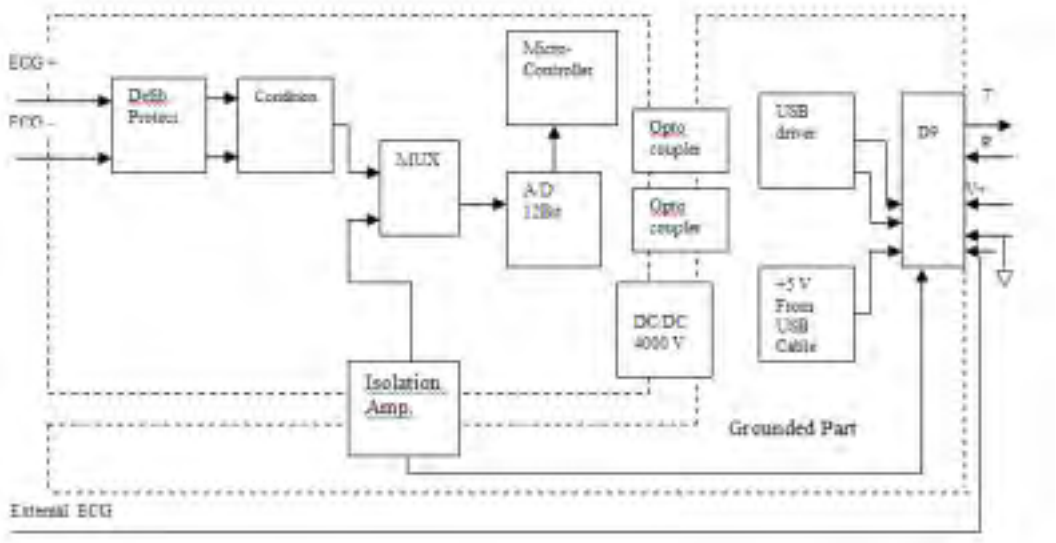


Figure 5-43 ECG Patient I/O Module Block Diagram

5-7-3-2 ECG Patient I/O Module Specifications

5-7-3-2-1 Power Consumption

The ECG and Ext-ECG modules use 5V (taken from the USB socket on the host).

Estimation: 80mA for ECG function and 50mA when working with EXT-ECG function

5-7-3-2-2 Sample Rate

Sampling rate of the ECG signals is: 600 samples/second.

5-7-3-2-3 Bandwidth

The ECG Bandwidth is 0.05 to 150Hz.

5-7-3-3 Isolation

The ECG signals are isolated from the Vivid-i™ system to comply with IEC601-1 type CF device classification. All leakage and auxiliary currents apply the values listed in Table 5-21 below (taken from table IV in IEC601-1, section 19.3):

Table 5-21 Leakage and Auxiliary Current Values

Leakage Current	Normal Condition	Single Fault Condition
Earth leakage current	0.5mA	1mA
Enclosure leakage current	0.1mA	0.5mA
Patient leakage current	0.01mA	0.05mA
Patient auxiliary current	0.01mA	0.05mA

The ECG signals have double, reinforced isolation (B-a) from live parts. Hence, creepage distance and air clearance in the module are 8 mm and 5 mm respectively, to withstand 4000 volts isolation between applied part and grounded part.

The applied parts and enclosure have basic isolation (B-a).Therefore, creepage distance and air clearance in the module are 4 mm and 2.5 mm respectively, to withstand 1500 volts isolation between applied parts and enclosure.

Section 5-8
Vivid-i™ Power Requirements

5-8-1 Electrical Power

The Vivid-i™ system can operate between 100 and 240V at 50/60 Hz via an AC/DC converter which supplies a 20V DC output and 4.5 amps.

Section 5-9
Peripherals

5-9-1 Introduction

The following peripherals are used with the Vivid-i™ portable ultrasound scanner:

- VCR (connected via VGA-to-video converter)
- Black & White Digital Printer (connected via USB)
- Color Digital Printer (connected via USB)
- Color Inkjet Printer (connected via USB)
- DVD/CD-RW (connected via USB)
- MOD (connected via a SCSI-to-USB converter)
- Bluetooth Adapter (connected via USB)
- Wireless Network Adapter (connected via PCMCIA)

All peripherals are connected via a USB or PCMCIA ports.

5-9-1-1 VCR and Video Converter

The VCR operation is controlled from the VCR front panel. The VCR operation is completely independent of the Vivid-i™ system. One must obtain the appropriate PAL or NTSC VCR in accordance with the regional standards. The VCR is connected to the Vivid-i™ system via a VGA-to-video converter; the video converter must be set up to fit the regional standards - for details see Figure 3-34 on page 3-42.

In some regions, the VCR is used as an official patient information back-up device. To obtain the maximum image quality it is recommended to use S-VHS video tapes and make sure that the VCR is setup for *High Quality* recording.

5-9-1-2 Printers

5-9-1-2-1 Black & White Digital Printer

The B&W Digital Printer receives image data and the print command via the USB port which is controlled by the keys **Print** or **Alt+Print** on the Vivid-i™ control panel.

5-9-1-2-2 Color Digital Printer

The Color Digital Printer receives image data and the print command via the USB port which is controlled by the keys **Print** or **Alt + Print** on the Vivid-i™ control panel.

5-9-1-2-3 Color Inkjet Printer

The Color Inkjet Printer is used to print out reports and exams and is controlled in one of three ways, depending on the system configuration:

- directly via the USB port
- via two Bluetooth adapters (one connected to the printer, and the other to a USB port on the Vivid-i™
- via LAN connection

The printing operation to the Color Inkjet Printer is performed by pressing the **Alt+P** keys. Normally, inkjet printers are used to print out Reports but in some cases also ultrasound images.

5-9-1-3 DVD/CD Reader and CD Writer (DVD/CDR-W)

The DVD/CDR-W is used to back-up images and reports, in the similar way as using the MOD. In addition, the DVD/CDR-W is used as the main source of software upgrades and other service utility operations. The DVD/CDR-W can read all types of CDs including DVD. The DVD/CDR-W is controlled by the BEP via the USB port.

NOTE: The DVD/CD-RW does not support writing data in DVD format or DVD media size. Writing of data is done to the regular CD size of 700MB.

5-9-1-4 Magneto-Optical Drive (MOD)

The MOD is used to back-up images and Reports. The Backing up process enables storage of the images and Reports for future review on Vivid-i™ ultrasound units, or other EchoPac-compatible devices. The MOD is controlled by the CPU via a USB port supported by a USB-to-SCSI converter. Only 2.3 GB media are officially DICOM compatible. Magneto-Optical media of any other size (up to 9.2 GB) may be used for back-up, but will not be compatible with DICOM (even though they will be supported by a variety of GE DICOM reviewing stations such as, EchoPac).

5-9-1-5 Wireless Network Adapter

The Vivid-i™ supports a unique type of Wireless Network Adapter. For details regarding type and installation, refer to Wireless Network Adaptor on page 3 - 31.

The Wireless Network Adapter provides a mobile network connection to the local area network. The Wireless Network Adapter is supported via the PCMCIA port.

Section 5-10
Cooling System

5-10-1 General Description

The Vivid-i™ cooling system includes five fans which are controlled by the PMC on the ETX baseboard. The fans suck air out of the system through the side vents, removing the warm air from around the internal components of the Vivid-i™ - see Figure 5-44 below.

The structure of Vivid-i™ internal components has been designed to provide the best thermal conduction, allowing the maximum amount of heat to be removed from the system. It is crucial that the system ventilation access is not blocked; a distance of at least 20 cm from right and left of the system should be kept clear. In addition, operating the system in an unclean environment could introduce foreign objects into the unit and create blockage of the airflow, which may eventually cause irreparable damage to the system. There are therefore some minimal environmental conditions that should be provided for optimum operation of the system - for details and recommendations, refer to Table 2-2 on page 2-2.

Periodically, it may be necessary to clean the internal components of the system. This task should be performed by qualified personnel - refer to *Chapter 10 - Care and Maintenance* for more details.

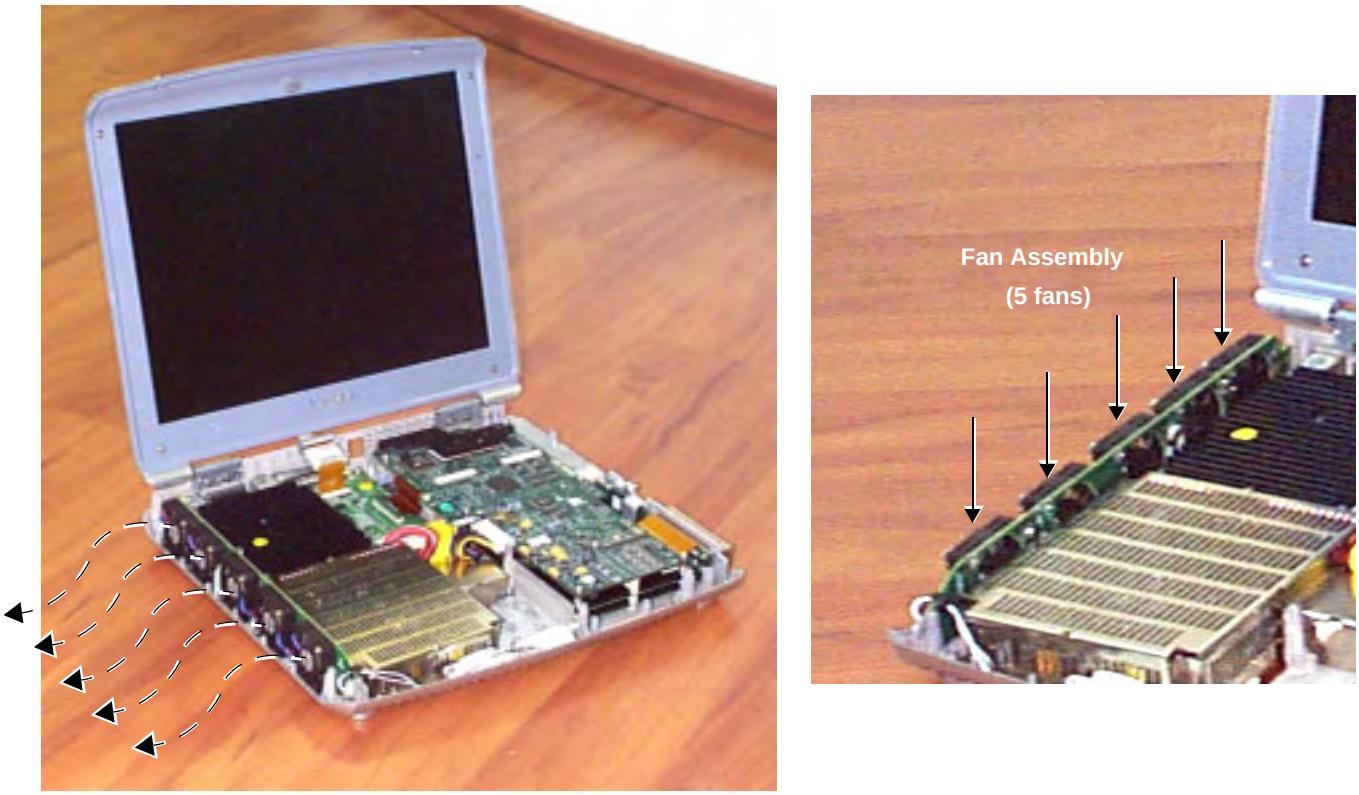


Figure 5-44 Airflow through the Vivid-i™ System

Section 5-11
Common Service Platform

5-11-1 Introduction

The Service Platform contains a set of software modules that are common to many of GE's ultrasound and cardiology systems. This web-enabled technology provides linkage to e-Services, e-Commerce, and the iCenter, making GE's scanners more e-enabled than ever.

5-11-2 *iLinq* Interactive Platform Features

Many of the services of the Common Service Platform come from its integration with *iLinq*. The following sections contain a brief introduction of *iLinq's* features.

5-11-2-1 Web Server/Browser

The Service platform and other Service software use the *iLinq* web server and browser.

5-11-2-2 Connectivity

This feature provides basic connectivity between the scanner and the OnLine Center (OLC).

5-11-2-3 Configuration

This feature provides the interfaces to configure various *iLinq* parameters.

5-11-2-4 Contact GE

Allows a one-switch touch for the user to contact the OnLine Center and describe problems with their scanner in an easy and convenient way.

5-11-2-5 Interactive Application

The main application is displayed in the form of HTML pages whenever the browser starts. This is the entry point for any user to start any *iLinq* application.

5-11-3 Global Service User Interface (GSUI)

GSUI is the pattern for the user interface. This interface standard will be followed by all modalities to achieve a common look-and-feel for service software across all GEMS products.

5-11-3-1 Internationalization

The user interfaces provided by the service platform are designed for GE personnel and, as such, are in English only. At this time, there is no multi-lingual capability built into the Common Service Interface.

5-11-3-2 Service Login

Press the switch with the wrench icon ( ) in the status bar at the bottom of the video screen.

This switch links the user or the Field Engineer (FE) to the service login screen.

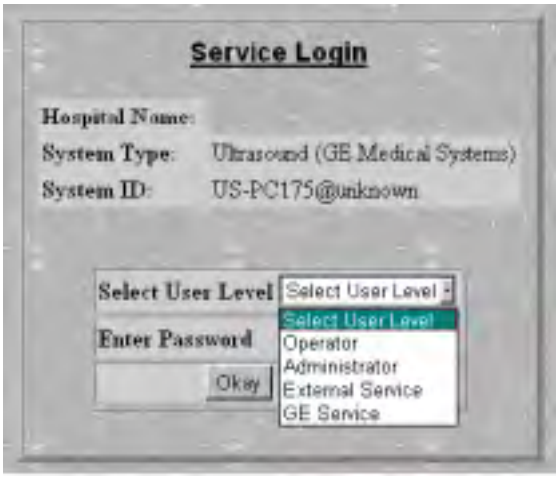


Figure 5-45 Service Login Screen

5-11-3-3 Access / Security

The service interface has different access and security user levels. Users are only granted access to the tools they are authorized to use.

Table 5-22 Access Authorization

User Level	Access Authorization
Operator	These service tools are normally used in-house and are protected with a password.
Administrator	Use the OnLine Center access method provided by *iLinq*.
External Service	Access is protected with a password.
GE Service	Requires knowledge of a password.

A modem on the scanner is specifically intended for *iLinq* use (by the user) and for InSite use.

Every access request, whether successful or not, will be logged into a service access log that is viewable to authorized users.

See *Chapter 7 - Diagnostics/Troubleshooting* for more information about InSite and the Global Service User Interface.

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Chapter 6
Service Adjustments

Section 6-1
Overview

6-1-1 Purpose of Chapter 6

This section provides references to the procedures required for testing and adjusting the Vivid-i™ portable ultrasound scanner. These tests are optional, and may be used to check the system for errors.

NOTE: There are no voltage adjustments required.

6-1-2 LCD Display Adjustments and Calibration

Overall low image quality or "shades" visible on the Vivid-i™ LCD Display may be the result of improper monitor calibration. Therefore, adjustments may be made to the *Brightness*, *Contrast* and/or *Blue Tint*, as required.

Access the Calibration Screen (by pressing <**CTRL**>+<**ALT**>+<**P**>), then follow the relevant procedure instructions described below.

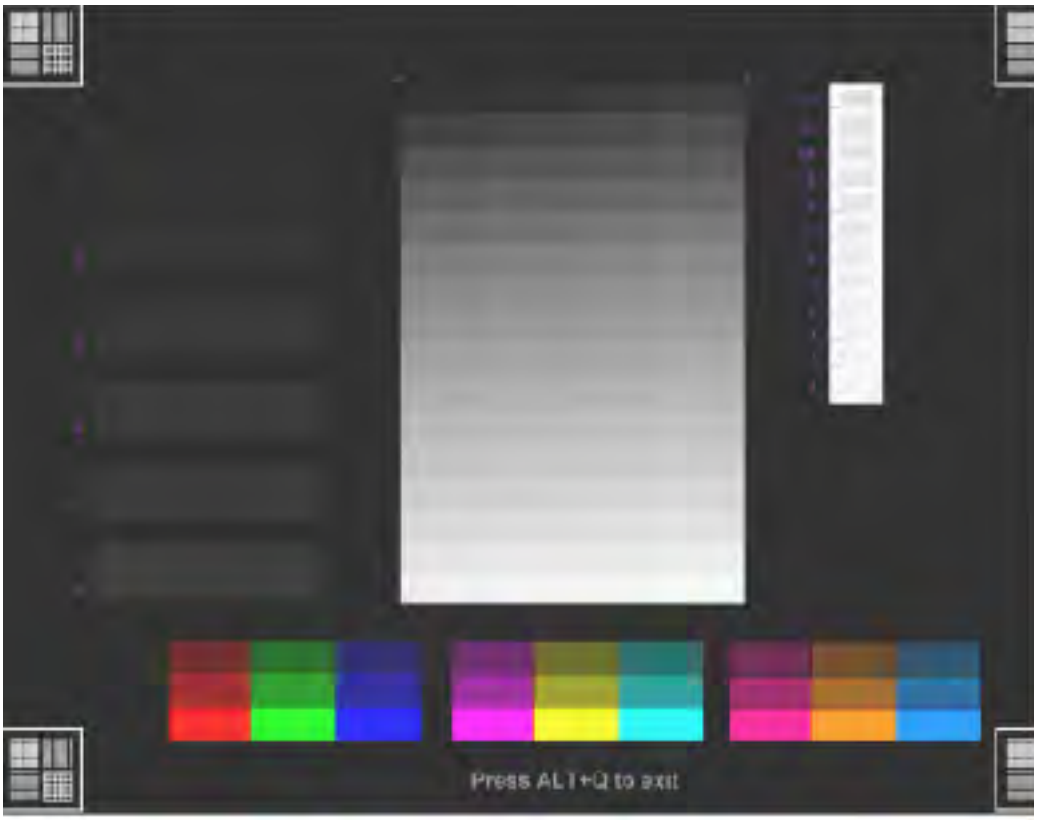


Figure 6-1 LCD Display Calibration Screen

Note: While working with systems with software 4.1.1 build 51 (or above), the Hot keys used to exit the Calibration Screen are: <**ALT**>+<**Q**>.

6-1-2-1 Brightness Adjustment Procedure

- **To adjust the Brightness:** hold down <**ALT**>, then use the **Pg Up** and **Pg Dn** keys, as required.

  Repeatedly pressing **Pg Dn** will ***decrease*** the brightness

  Repeatedly pressing will **Pg Up** ***increase*** the brightness.

  To assist in making Brightness adjustments, an adjustment bar is displayed below the screen:

Figure 6-2 LCD Display - Brightness Adjustment

Note: The screen Brightness is calibrated when the dark blocks on the left (numbers 1 through 6) and the white bars on the right (numbers 1 through 12) are all visible.

6-1-2-2 Contrast Adjustment Procedure

- **To adjust the Contrast:** hold down <**ALT**>, then use the *left* and *right* arrow keys, as required.

  Repeatedly pressing ← will ***decrease*** the Contrast; repeatedly pressing → will ***increase*** the Contrast.

  To assist in making Contrast adjustments, an adjustment bar is displayed below the screen:

Figure 6-3 LCD Display - Contrast Adjustment

Note: It is highly recommended to set the contrast to maximum. Press <**ALT**>+<**Steer Righ**t> to *increase* the number of green bars to 7 (maximum).

6-1-2-3 Blue Tint Adjustment Procedure

- **To adjust the Blue Tint:** hold down <**ALT**>, then use the **<** and **>** keys, as required.

  Repeatedly pressing **<** will ***decrease*** the blue tint; repeatedly pressing **>** will ***increase*** the blue tint.

  To assist in making blue tint adjustments, an adjustment bar is displayed below the screen:

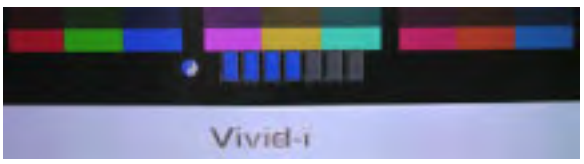


Figure 6-4 LCD Display - Blue Tint Adjustment

6-1-3 Keyboard Adjustments

6-1-3-1 Backlighting Intensity Adjustment Procedure

To make adjustments to the Keyboard Backlighting intensity, follow the procedure described in Adjust Keyboard Backlight Intensity on page 3 - 65.

6-1-4 Video System Adjustments

6-1-4-1 Video System Adjustment Procedure

For details on Video System adjustments (PAL or NTSC setup), refer to Figure 3-34 on page 3-42.

6-1-5 Beamformer Calibration

6-1-5-1 Beamformer Calibration Procedure

For details on Beamformer Calibration adjustments, refer to *Chapter 7 - Diagnostics/Troubleshooting*.

6-1-6 Battery Calibration

NOTE: It is recommended to perform the Battery Calibration procedure when the battery is fully charged (as much as the system allows) and preferably to commence the procedure towards the end of the working day - then allow it to continue to run automatically, overnight. For details, see Figure 6-5 below.

IMPORTANT: ***During the Battery Calibration procedure, no scanning can be performed!***

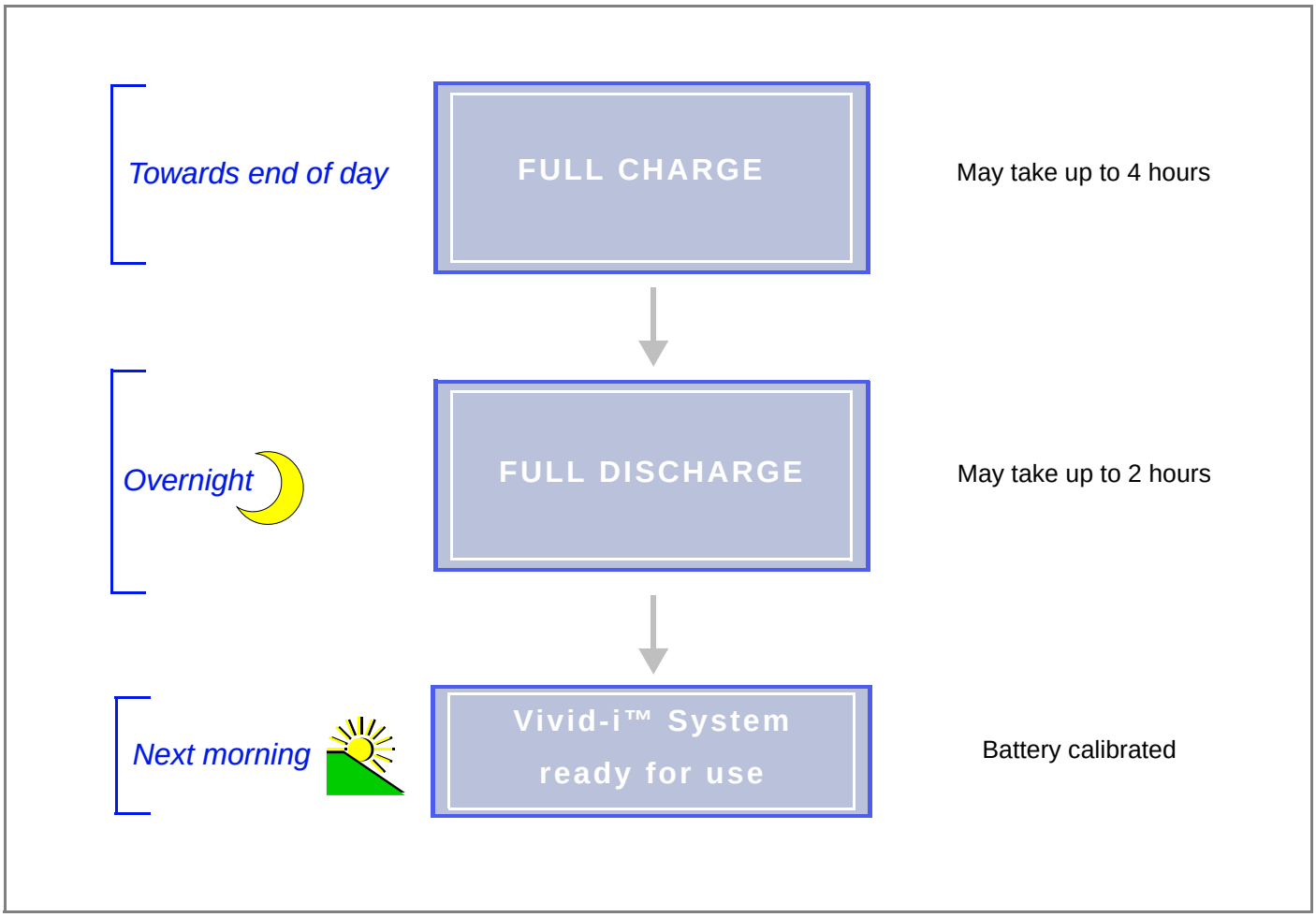


Figure 6-5 Recommendations - Battery Calibration Procedure

Note: For step-by-step instructions, see Performing the Battery Calibration Procedure on page 6 - 5.

6-1-6-1 Performing the Battery Calibration Procedure

NOTE: It is recommended to commence this procedure towards the end of the working day (when the battery is fully charged) then allow the procedure to be completed overnight, as outlined in Figure 6-5.

1) Click on the battery icon at the bottom of the scanning screen
OR
from the message window shown below, click **Recalibrate**.

The System runs on AC Power. Battery is charged 99%. Battery power is full
Battery monitoring indicates a recommendation to perform calibration in order to maintain prolonged battery life. Battery re-calibration may take several hours.
Recalibrate
Ignore

The Battery Calibration Wizard (Page 1) opens - Figure 6-6.

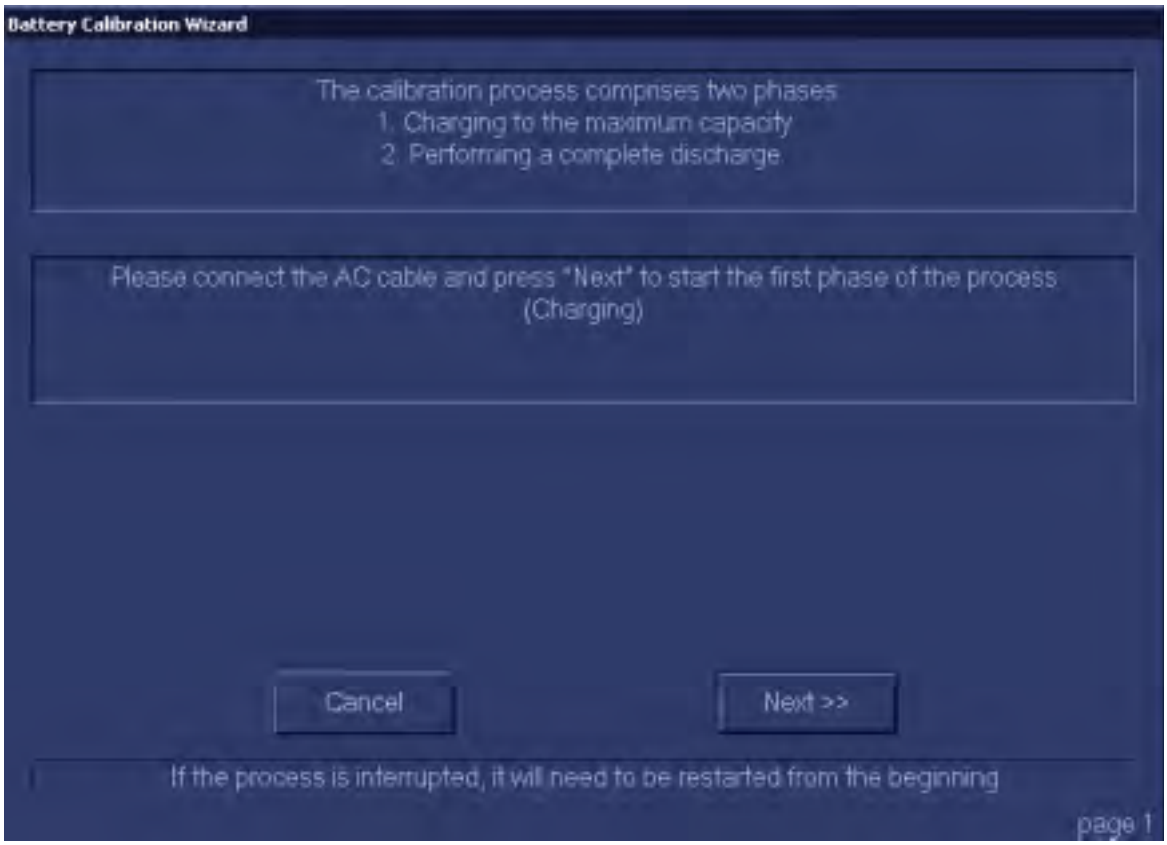

Battery Calibration Wizard
The calibration process comprises two phases
1. Charging to the maximum capacity
2. Performing a complete discharge
Please connect the AC cable and press "Next" to start the first phase of the process (Charging)
Cancel
Next >>
If the process is interrupted, it will need to be restarted from the beginning
page 1

Figure 6-6 Battery Calibration Wizard - Page 1

2.) Make sure the AC power cable is connected to the Vivid-i™, then click **Next** to commence the first stage of the process (Full Charge to maximum capacity).

This step will fully recharge the battery and may take up to 4 hours.

3.) Wait for the confirmation window to be displayed showing that the battery is fully charged.

(See *Battery Calibration Wizard Page 2 in Figure 6-7).*

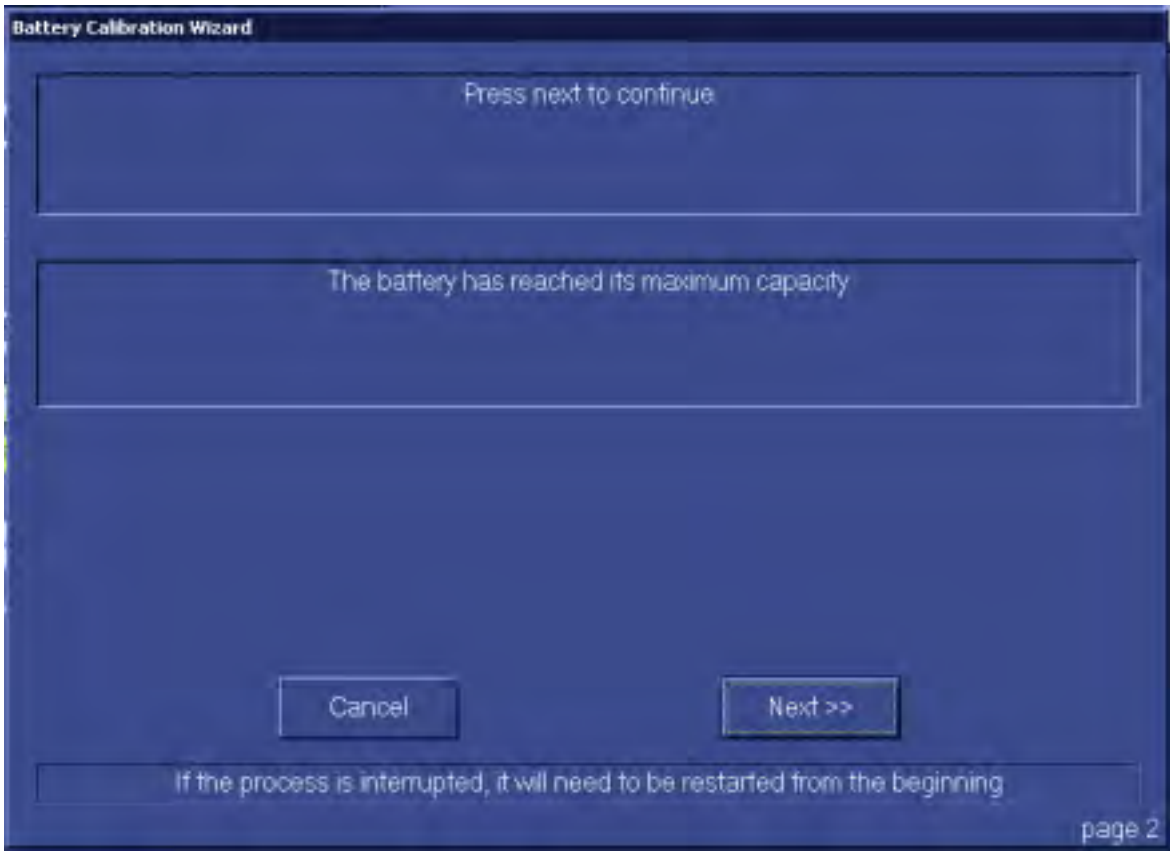

Battery Calibration Wizard
Press next to continue
The battery has reached its maximum capacity
Cancel
Next >>
If the process is interrupted, it will need to be restarted from the beginning
page 2

Figure 6-7 Battery Calibration Wizard - Page 2

4.) Click **Next**.

The Battery Calibration Wizard (Page 3) opens - see Figure 6-8 on page 6-7.

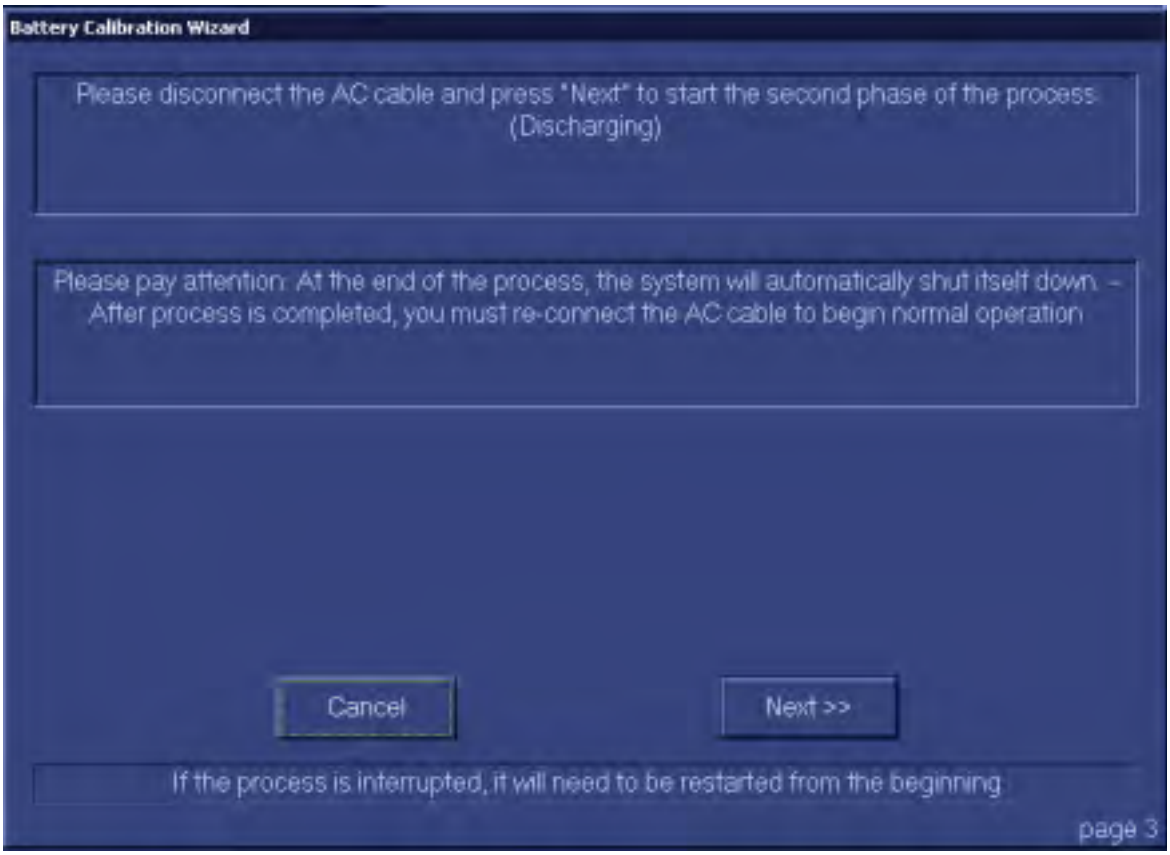

Battery Calibration Wizard
Please disconnect the AC cable and press "Next" to start the second phase of the process
(Discharging)
Please pay attention: At the end of the process, the system will automatically shut itself down -
After process is completed, you must re-connect the AC cable to begin normal operation
Cancel
Next >>
If the process is interrupted, it will need to be restarted from the beginning
page 3

Figure 6-8 Battery Calibration Wizard - Page 3

5.) Disconnect the AC power cable from the Vivid-i™, then click **Next**.

The second phase of the process (Full Discharge) commences and the Battery Calibration Wizard (Page 3) is displayed as shown in Figure 6-9 on page 6-8.

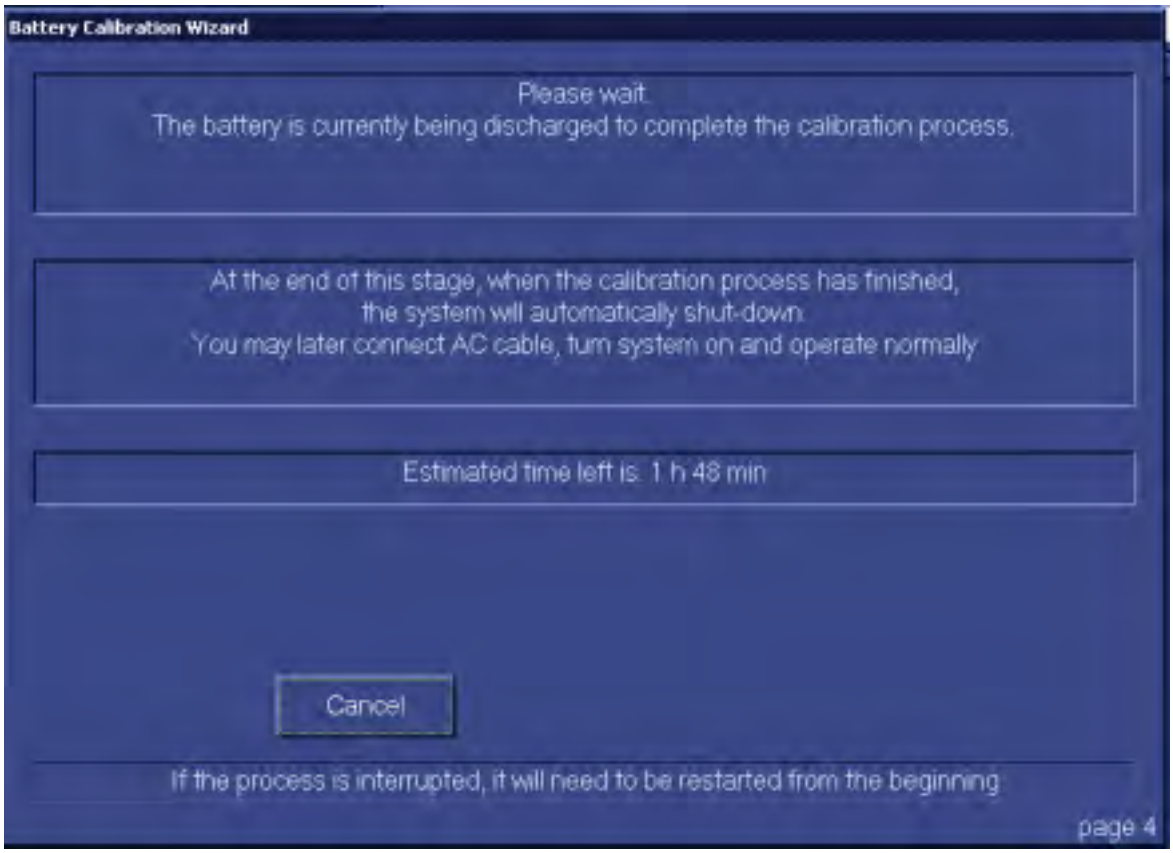

Battery Calibration Wizard
Please wait
The battery is currently being discharged to complete the calibration process.
At the end of this stage, when the calibration process has finished,
the system will automatically shut-down.
You may later connect AC cable, turn system on and operate normally
Estimated time left is: 1 h 48 min
Cancel
If the process is interrupted, it will need to be restarted from the beginning
page 4

Figure 6-9 Battery Calibration Wizard - Page 3

6.) Leave the system overnight to complete the Full Discharge process.

The Vivid-i™ system automatically shuts down at the end of this process; the battery calibration procedure is now complete.

7.) The following morning, re-connect the AC power cable and turn ON power to the system.

Note: The system may now be used normally, without any dependence on battery capacity status.

Chapter 7
Diagnostics/Troubleshooting

Section 7-1
Overview

7-1-1 Purpose of Chapter

This chapter describes how to set up and run diagnostic tools to locate system problems and failures. The Vivid-i™ ultrasound unit includes built-in diagnostic tools that can be accessed from the scanner application.

Table 7-1 Contents in Chapter 7

Section	Description	Page Number
7-1	Overview	7-1
7-2	Diagnostics	7-2
7-3	Performing Full System Diagnostics	7-18
7-4	Performing Front End (FE) Diagnostics	7-23
7-5	Monitoring Tests	7-87
7-6	Performing Back End Diagnostics on the System	7-109
7-7	Common Service Interface	7-127
7-8	Automatic Error Log	7-165

Section 7-2
Diagnostics

7-2-1 Diagnostic Tools

The diagnostic tools are provided for checking the system which includes the power supply, temperature, fan operation, board functions, Back-end signal processing performance, keyboard operation, peripherals, and so on.

7-2-2 Diagnostic Procedure Summary

The diagnostic tools are used to identify and correct problems, as follows:

- When the system boots up, it loads all the required drivers and establishes communication with the front board, via the PCI bus. Check the system presets to verify that good unit performance can be achieved.
- When the Back End is operating, you can verify proper voltages and temperatures in the Front End and in the Power Supply. To check the Front End parts, the tests must follow a logical sequence, in order to identify the faulty component. For example, testing communication between the Front End and the Back End begins by testing the RFI board and the PCI bus, before testing all the other boards, *in the following sequence* (as applicable):
    * RFI board, TR32 boards, Probe and MUX board
- Many error messages are displayed due to minor changes in calibration that may occur during normal operation. Before performing diagnostic tests, perform calibration, as described in the *DC Offset Calibration* section, page 7-24. If error messages are displayed after performing calibration, perform the Front End diagnostics described in Performing Front End (FE) Diagnostics on page 7 - 23.

7-2-3 Accessing the Diagnostic Test Window

The diagnostic tools are accessed from 2D-Mode by simultaneously pressing **<ALT+Config>** on the alphanumeric keyboard. The *Diagnostic Test* window is displayed, as shown below:

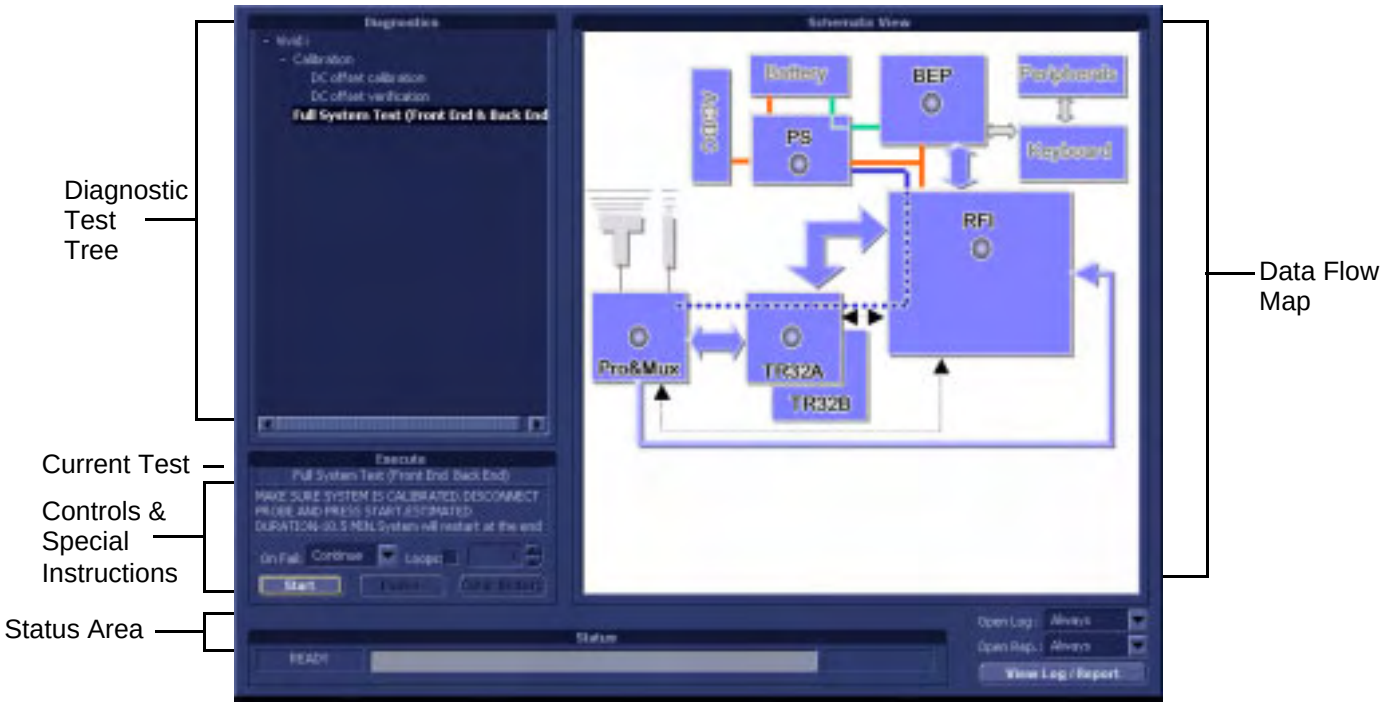


Figure 7-1 Diagnostic Test Window

Note: For a summary of the various Diagnostic Test Menu options, together with details of the information displayed in different areas of the screen, see Table 7-2 on page 7-4 and *Diagnostic Test Window Menu Options* section, on page 7-9.

Note: When performing a specific test for an intermittent problem, it is highly recommended to use the Loop option (use the combo box or type the required number of loops) as appropriate. Looping the test will assist in detecting the problem.

Note: Once the test has been completed, a log can be viewed, as described in the *View Log* section, on page 7-5.

The *Diagnostics Test Window* (Figure 7-1) comprises the following areas and menu options:

Table 7-2 Vivid-i™ Diagnostics Test Window and Menu Options

Option	Description	Comments
Data Flow Map	Displays a schematic view of the Vivid-i™ data flow (Data Flow map). The functionality of each button in this area corresponds to that of the test of the same name in the Diagnostic Test Tree. You are able to select and perform the Vivid-i™ diagnostic tests by trackballing to the required test (listed in the Diagnostic Test Tree) and pressing **Set**. Note: Double-clicking a button in the Data Flow Map expands the corresponding list of tests (in the Diagnostic Test Tree) available for that component (or group of components).	In the Data Flow map Status Window, status indicators are highlighted by color, indicating the following: • **Light Blue:** The selected test will be performed on this component, or group of components. • **Light Gray:** This component, or group of components will be *excluded* from the test/s. • **Green:** All recommended tests for these components have been completed and no problems were identified. • **Red:** At least one problem was identified in these components during the performance of the test. • **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.
Diagnostic Test Tree	Displays a menu of diagnostic test sequences and tests available for selection.	
Execute	Displays the name of the currently-selected diagnostic test (or test sequence).	
Controls and Special Instructions	Displays any special instructions for checks required before performing the test. For example, *Make sure system is calibrated. Disconnect probe and press **Start***.	The area also includes these controls: • a **Start/Stop** button used to commence a test. After pressing Start, the button may be used to stop a test before completion. • a **Pause** button used to pause a test before resuming. • a **Clear History** button used to clear the highlighted status indication in the Data Flow map (schematic view). Note: this button is not used to clear the test sequence log files (refer to Clear Log button in Table 7-3 on page 7-5). • an **On Fail** combo box - used to select the action required in the event that the test fails (Stop or Continue**)**. • a **Loops** checkbox. If activated, the test will be repeated for the selected number of loops.
Status Area	Displays instructions during the test, as well as test status and result messages.	The following messages are displayed: • **Test status:** For example, **Ready for test, Executing,** or **Finished.** • **Instructions:** During the course of a diagnostic test, any instructions to the user are displayed in the Status area. For example, **Wait.** • **Test results:** For example, **Passed** or **Failed**. The area also includes two progress bars: • **Progress bar:** Shows progress of an individual test (within a sequence of tests). The area also includes: • a **View Log** button used to review the test results. (Enabled only after test execution). Refer to *View Log* section, on page 7-5.

7-2-3-1 View Log

From the *Diagnostics Test Window* (Figure 7-1) the View Log button provides access to the test result information described below.This is shown in the View Log dialog box (see example in Figure 7-2 below) which is displayed in the *upper* right portion of the screen (over the Data Flow Map area).

Table 7-3 Vivid-i™ Diagnostics Test Window - View Log

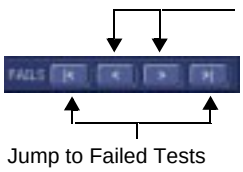
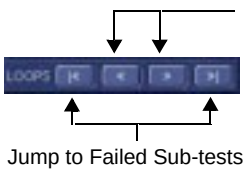
Option	Description	Comments
File	Log file number	
Date	Date test was performed.	
Time	Time test was executed.	
Log File Scroll Bar and Arrows	Enables scrolling through the list of Log Files	
Tests	Displays test sequence log files. Shows a list of the specific diagnostic test/s included in the currently-selected test sequence.	
Result	Lists test results as either PASS or FAIL.	
Loop	Lists name of loop and the sub-tests within the loop	
Date	Date test was performed.	
Tests Scroll Bar and Arrows	Enables scrolling through the list of Test Log Files.	A test sequence may have up to four reports. Since only one specific test may have failed, the scroll arrows enable jumping directly from one Failed test to the next (i.e., failures only). Alternatively, you can scroll through all the tests (one-by-one). 
Loops Scroll Bar and Arrows	Enables scrolling through the Loops and sub-tests.	A test may have many loops, each of which may have sub-tests. Since only one specific sub-test may have failed, the scroll arrows enable jumping directly from one Failed sub-test to the next (i.e., failures only). Alternatively, you can scroll through all the loops (one-by-one). 

Table 7-3 Vivid-i™ Diagnostics Test Window - View Log

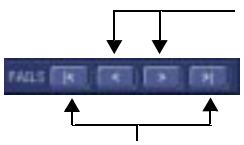
Option	Description	Comments
Reports	Displays the specific report (or list of reports) for the currently-selected test sequence. (shows all OK and failed tests) Certain tests will have more than one report (see the example in Figure 7-2 below).	Double-clicking on a currently-selected report displays that report in the Report window (lower portion of the View Log dialog box) - refer to Figure 7-3 below.
Reports Scroll Bar and Arrows	Enables scrolling through the list of Reports	A test sequence may have up to four reports. Since only one specific test may have failed, the scroll arrows enable jumping directly from one Failed test report to the next (i.e., failures only). Alternatively, you can scroll through all the reports (one-by-one). 
Erase Button	Clears all test sequence log files for that specific (currently selected) test listed in the Tests window (passed and failed tests).	It is *not recommended* to clear the test sequence log files unless a test failed due to user intervention or as a result of a false alarm. (It is necessary to erase each log file separately).
Exit Button	Closes the *View Log* dialog box	Returns to the Diagnostic Test window.
Report Window	Lower portion of the View Log dialog box where the the currently-selected report is displayed in a separate window (see the example in Figure 7-2). The displayed *Average*, *Deviation*, *Max* and *Min* values are dynamically updated.	Visible only after test execution.
Report window Scroll Arrows	Enables scrolling through all channels. Displays the currently-selected channel number. For example, Count: 64	
Close Button	Closes the Report window.	

Figure 7-2 View Log Dialog Box

In Figure 7-2 above, the selected report (Test signal amplitude, first harmonic) is displayed in the Report window. When there is more than one report listed, the first report is displayed (by default).

Double-clicking on another report (for example, Test signal amplitude second harmonic), will evoke the display of that report in the Report window as shown in the example in Figure 7-3 below.

Figure 7-3 ADC Test - Viewing Report (Test Signal Amplitude 2nd Harmonic)

NOTE: Left and right arrows provided in the View Report window enable scrolling between the different channels.
Left-clicking on a currently-selected channel marks a red square on the report graph, and also evokes the display of the following information relative to that specific point: Average, Deviation (standard deviation from the Average), Max, and Min.
The signal should be within the limits marked in the white area (the dotted line represents the Average), as shown in Figure 7-3.

7-2-4 Diagnostic Test Window Menu Options

The *Diagnostic Test* menu includes the options described below.

7-2-4-1 Full System Test

NOTE: The Full System Test requires approximately 10 minutes for completion.

7-2-4-1-1 Full System Test (FE and BEP)

Performs a full sequence of complete Front End and Back End tests (automatically) that do not require user intervention. This is particularly recommended for detecting problems that are intermittent in nature, since a test may be paused at any stage and any detected failures reviewed.

For test procedure instructions, see the *Full System Test (FE and BEP)* section, on page 7-19.

7-2-4-2 Front End Tests

NOTE: The Front End Tests may be performed in any order. However, due to the functional dependencies between each of the Front End boards, it is recommended to perform the tests on the boards in the following order (as described in the Performing Front End (FE) Diagnostics section, on page 7-23):

1.) RFI board
2.) TR32 boards
3.) PM board

Performing the tests in the proper sequence will help to derive the correct conclusions regarding the source of the problem.

7-2-4-2-1 Calibration

- **DC Offset Calibration**

  This is used to test proper operation of the Beamformer, and TR32A and TR32B boards. The test generates no signal at the input to the Beamformer and is used to calibrate the system, or to test system calibration in order to check that the current calibration values are valid for the current environment.
  For test procedure instructions, see the *DC Offset Calibration* section, page 7-24.

- **DC Offset Verification**

  This test verifies that the calibration saved on the Hard Disk is within acceptable limits.
  For test procedure instructions, see the *DC Offset Verification* section, page 7-27.

7-2-4-2-2 RFI Tests

- **Full RFI Test**

  The Full RFI Test performs a complete test sequence and includes all the RFI board tests (described below).
  For test procedure instructions, see the *Full RFI Test* section, page 7-30.

- **RFI FE Cache Test**

  Tests the cache memory. (The cache memory for the PM, TR32A, TR32B and the RFI boards is located on the RFI board). This test sends a specific pattern into the cache memory and the expected result is to see a predefined pattern as the output from the cache memory.
  For test procedure instructions, see the *RFI FE Cache Test* section, page 7-33.

- **RFI Analog Circuits Test**

  This tests the RFI analog circuitry (which is responsible for temperature monitoring and communication with the TEE probe).
  For test procedure instructions, see the *RFI Analog Circuits Test* section, page 7-36.

- **RFI Demodulator Short Test**

  This is used to perform a short digital test on the demodulator to make sure that the demodulator on the FPGA is functioning in accordance with the specifications.
  For test procedure instructions, see the *RFI Demodulator Short Test* section, page 7-39.

- **RFI Audio Test**

  This tests the audio frequency for Doppler sound (coming from the RFI board to the Back End). During this test - approximately midway on the progress bar - a loud, high-pitched sound will be heard coming from the speakers.
  For procedure details, see the *RFI Audio Test* section, page 7-42.

Note: To conduct a complete audio test of the system, it is also necessary to perform an audio test which is part of the Back End - for details, refer to the *PC Doctor* section, page 7-14.

7-2-4-2-3 TR32 Tests

- **Beamformer Tests**

  - **TR32 BF Digital Test**

    This is an internal test of the Beamformers. Each Beamformer generates an internal test pattern (first on the TR32A board and then on the TR32B board). This test pattern is generated through MLA0 and MLA1 to the RFI.

    Therefore, in the first phase of the test, the Beamformer on the TR32A board generates a test pattern signal (while TR32B generates pattern *zero*).

    In the second phase of the test, the Beamformer on the TR32A board generates a test pattern *zero* - while the BF on the TR32B board generates a test pattern signal.

    Both the test patterns are summed and focused on the BF 32A and generated to the RFI demodulator.

    For test procedure instructions, see the *TR32 BF Digital Test* section, page 7-45.

  - **System BF Digital Test**

    In this test, both Beamformers are generating internal test patterns. The patterns from the BF of the TR 32B board are summed and focused in the BF of the TR32A board. From here, the pattern is generated through MLA0 and MLA1 to the RFI.

    For test procedure instructions, see the *System BF Digital Test* section, page 7-48

  - **ADC Test**

    The ADC Test is used to check that 1st harmonic, 2nd harmonic, 3rd harmonic, and background noise are within pre-defined limits.

    In this test, a signal is generated from the RFI into the TR switches. For all 64 channels of the system, each signal goes through the following: pre-amplification, filtering, analog-to-digital conversion, and focusing. The test signal is at a frequency of 2 MHz.

    For test procedure instructions, see the *ADC Test* section, page 7-51.

- **Receive (RX) Tests**

  - **RX Test**

    The RX Test is performed with no probe connected. This is used to check that the signal values at the input to the TR32 board are as expected.

    When performing the RX Test, test signals are generated from the RFI, and the results are expected to be of fairly high amplitudes with no distortion of the frequency.

    For test procedure instructions, see the *RX Test* section, page 7-56.

7-2-4-2-4 PM Tests

- **ACW Test**

  - **ACW IQ Symmetry Test**

    The ACW (analog CW test) is performed when CW problems are suspected. Checks the symmetry of I and Q signals. Inputs a test signal shifted from the mixer frequency, then calculates the RMS of the I and Q vectors and compares them. The RMS vectors should be lower than the defined limits (shown on the report).

    For test procedure instructions, see the *ACW IQ Symmetry Test* section, page 7-60.

- **ACW Matrix Test**

  The ACW (Analog CW) Matrix Test checks the path of all 32 RX channels to all VCA outputs on the TR32B board. A test signal shifted from the mixer frequency is generated and the receive signal amplitude and frequency is then checked. The frequency should be matched to the frequency shift of the input signal (shown on the Test report).

  For test procedure instructions, see the *ACW Matrix Test* section, page 7-64.

- **ACW Delay Range Test**

  The ACW (Analog CW) Delay Range Test checks the path of VCA outputs to the Delay taps in all three frequency ranges. The expected results are shown on the Test report.

  For test procedure instructions, see the *ACW Delay Range Test* section, page 7-68.

- **ACW Pre-Mixer Gain Test**

  Note: This test will be available for future versions of the Vivid-i™ system.

  The ACW (Analog CW) Pre-Mixer Gain Test checks the PM Gain level. A test signal shifted from the mixer frequency is generated and the test compares the 0db RMS to the levels of the other Gains. The RMS level is expected to be lower than the selected Gain level (as shown on the Test report).

  For test procedure instructions, see the *ACW Pre-Mixer Gain Test* section, page 7-72.

- **ACW BPF Test**

  Note: This test will be available for future versions of the Vivid-i™ system.

  The ACW (Analog CW) BPF Test is used to check the operation of all the Bend Pass filters. A test signal is shifted from the mixer frequency and then the test checks the filter response. Attenuation of the filters in different frequencies should be within pre-defined limits (shown on the Test report).

  For test procedure instructions, see the *ACW BPF Test* section, page 7-75.

- **ACW HPF Test**

  Note: This test will be available for future versions of the Vivid-i™ system.

  The ACW (Analog CW) HPF Test is used to check the operation of the High Pass Filters (300Hz and 600 Hz). A test signal is shifted from the mixer frequency and then the test checks the filter response. Attenuation of the filters in different frequencies should be within pre-defined limits (shown on the Test report).

  For test procedure instructions, see the *ACW HPF Test* section, page 7-80.

- **Pencil Test**

  - **Pencil Rx Test**

    Note: This test will be available for future versions of the Vivid-i™ system.

    When performing the Pencil Rx Test, no probes or jig are connected to the system.

    This test is performed to check the receive functions. During this test, signals are transmitted through the circuitry. The received frequency should match the transmitted test frequency, as shown in the Test report.

    For test procedure instructions, see the *Pencil Rx Test* section, page 7-83.

7-2-4-3 Monitoring Tests

7-2-4-3-1 Full System Monitoring Test

The Full System Monitoring Test performs a full sequence of all monitoring tests (as described below).

For test procedure instructions, see the *Full System Monitoring Test* section, page 7-87.

7-2-4-3-2 Fixed Voltages Test

The Fixed Voltages Test is used to check the Power Supply unit and to ensure that voltages are within the pre-defined limits.

For test procedure instructions, see the *Fixed Voltages Test* section, page 7-94.

7-2-4-3-3 Temperatures Test

The Temperatures Test is used to check the temperature of the Front End and the Back End. The test reads all the temperature sensors in the system to ensure that the system is operating within the pre-defined temperature limits and that there is no overheating of any components.

For test procedure instructions, see the *Temperatures Test* section, page 7-97.

7-2-4-3-4 Fans Speed Test

The Fans Speed Monitoring Test is used to check that the Fan Controller is fully operational and that all five fans operate simultaneously (at the pre-defined speed) to maintain proper cooling and the optimum operating temperature of all Vivid-i™ system components.

For test procedure instructions, see the *Fans Speed Test* section, page 7-100.

7-2-4-3-5 Battery Parameters Test

The Battery Parameters Test is used to check the battery status with regard to the following:

- Battery capacity
- Charging voltage being supplied to the battery (or the voltage being supplied by the battery)
- Source of the power being provided to the system (i.e. external power via the AC/DC or via the battery [indicating the battery is either being charged or discharged]).

For test procedure instructions, see the *Battery Parameters Test* section, page 7-103.

7-2-4-3-6 Tx Voltages Test

The TX Voltages Test is used to test the transmit part of the power supply to make sure that the Tx voltage is within expected values.

For test procedure instructions, see the *Tx Voltages Test* section, page 7-106.

7-2-4-4 BEP Tests

The BEP Tests are performed to check of the various Back End hardware components, as outlined below. The procedures are described in detail in the *Performing Back End Diagnostics on the System* section, on page 7-109.

7-2-4-4-1 PC Doctor

The PC Doctor Tests are divided into two main groups: *Automatic* and *Interactive.* The automatic tests do not require user intervention. The procedure instructions for both groups are provided in the *PC Doctor* section, page 7-110.

- **Automatic**

  - **Full Back End Test without Hard Disk**

    This test performs a full system check without a Hard Disk scan. The test sequence includes all automatic tests (excluding the Hard Disk).

    For test procedure instructions, see the *Full Back End Test w/o Hard Disk Scan* section, page 7-110.

  - **Full PC Doctor Test (50 min)**

    The Full PC Doctor Test requires 50 mins (longer than the Full Test without Hard Drive). This test performs a full system check as well as a Hard Disk scan. The test sequence includes all automatic tests (including the Hard Disk).

    For test procedure instructions, see the *Full PC Doctor Test (50 min)* section, page 7-112.

  - **CPU Tests**

    The CPU Tests are used to perform a variety of CPU checks, as described below.

    For test procedure instructions, see the *CPU Tests* section, page 7-114

    - **CPU Full Test:** Performs a battery of tests on the CPU to ensure that it is working properly. All the remaining tests are performed as part of the CPU Test.
    - **CPU Registers:** Tests the CPU Registers using the default test patterns. On 32 bit CPUs, the extended registers are also checked. If errors are detected, the failed registers are listed.
    - **CPU Arithmetics:** Tests the proper function of the arithmetic commands ADC, ADD, DEC, DIV, IDIV, IMUL, INC, MUL, SBB and SUB with 16 and 32 bit operands. If errors are detected, the failed commands and operands are listed.

- **CPU String Operations:** Tests the proper operation of the string commands LODS, MOVS, SCAS and STOS with 8, 16 and 32 bit operands. If errors are detected, the failed commands and operands are listed.
- **CPU Logical Operations:** Tests the proper operation of the logical operations AND, NOT, OR and XOR with 16 and 32 bit operands. If errors are detected, the failed operands are listed.
- **CPU Math Registers:** Tests the coprocessor register stack, pointers and commands FLDLZ, FLDPI, FLDLN2, FLDLG2M FLDL2T FLDL2E and FLD1. If errors are detected, the failed steps and commands are listed.
- **CPU Math Commands:** Tests the coprocessor commands FBLD/FBSTP, FLD/FST, FXCH, FCOM, FICOM, FTST, FXAM and FUCOM. If errors are detected, the failed instructions are listed.
- **CPU Transcendental:** Tests the coprocessor transcendental commands F2XM1, FPATAN, FPTAN, FYL2XP1, FCOS, FSIN and FSINCOS. If errors are detected, the failed commands are listed.
- **CPU MMX Arithmetic:** Tests the MXX commands PADD, PSUB, PMUL and PMADD. If errors are detected, the failed commands are listed.
- **CPU MMX Logical:** Tests the MXX commands PAND, PANDN, POR and PXOR. If errors are detected, the failed commands are listed.
- **CPU MMX Shift:** Tests the MXX commands PSLL and PSRL. If errors are detected, the failed commands are listed.
- **CPU MMX Data Transfer:** Tests the MXX commands MOVD and MOVQ. If errors are detected, the failed commands are listed.
- **CPU MMX Misc.:** Tests the MXX commands PCMPEQ, PCMPGT, PACKSS, PACKUS and PUNPCK. If errors are detected, the failed commands are listed.

- **HD Test**

  The HD Tests are used to perform a variety of Hard Drive checks, as described below.

  For test procedure instructions, see the *HD Test* section, page 7-117.

  - **Hard Drive Full Test (w/o Scan):** Performs a battery of tests to examine the hard drive and ensure that it can perform all its functions. All the remaining tests are performed on the hard drive to ensure that the hard disk controller and the drive mechanism are working correctly. The disk surface itself is also checked. This test may take 3.5 minutes.
  - **Hard Drive Linear Seek:** Moves the hard disk drive heads from track 0 to the maximum track one track at a time.
  - **Hard Drive Funnel Seek:** Moves the hard disk drive heads in a funnel fashion (from the first track to the last, then to the second track, the second last track, the third track and so on).
  - **Hard Drive Surface Scan:** Scans the surface for defects on the hard disk drive.

- **Memory Test**

  The Memory Tests are used to perform a variety of memory checks, as described below.

  For test procedure instructions, see the *Memory Test* section, page 7-119.

  - **Full Memory Test:** Uses 18 test patterns to test memory locations. If errors are detected, the address of the block in which the error was detected is shown. During testing, these diagnostics will also look for parity errors and other exceptions. If encountered, these are added to the test log as errors.
  - **Memory Pattern Test:** Uses several test patterns to test as much memory as possible.
  - **Memory Parity Test:** Checks for parity errors on the memory bus during intensive string transfer operation. If an error is detected, the address of the failed block is displayed.

- **Video Test**

  The Video Tests are used to perform a variety of video diagnostic tests, as described below. These tests use 18 test patterns to fill the video buffer, testing your graphics acceleration and text output

  For test procedure instructions, see the *Video Test* section, page 7-121.

  - **Full Video Test:** Test the system's video capabilities. This involves testing the memory, testing the graphics acceleration and testing the text output. You can follow the tests being performed on the monitor. This test can be cancelled at any time by pressing **<Esc>** on the keyboard.
  - **Video Memory:** Tests the video memory by filling the video buffer with 18 test patterns, one pattern at a time. These tests fill the entire screen with a single color.
  - **Video Data Transfer:** Tests the graphics acceleration part of the video controller. This test fills the screen with black and white concentric squares, and rectangles of various sizes and colors. If errors are detected, the locations of the problems are displayed.
  - **Video Text Output:** Prints a text string in random sizes and colors to test the video device driver and video controller.

- **PCI Test**

  A Peripheral Component Interconnect (PCI) bus is a fast standard bus that is common in Pentium systems. The PCI Test is performed to ensure that the PCI bus is working up to speed. The motherboard is scanned to verify the configuration space and to ensure that the diagnostics can communicate with the board.

  For test procedure instructions, see the *PCI Test* section, page 7-123.

- **Network Test**

  A Network Interface Card (NIC) is a computer circuit board or card that is installed in a computer so that it can be connected to a network. Networks are used by businesses and some home users to connect PCs together so that they can share files and resources. Data travels over a network connection much faster than over standard internet connections.

  The PC Doctor Network Test will reveal that a network card is present without a driver installed. These cards are likely to not show up on a PC's list of network cards available for test. This may cause the test to return a result of "not applicable", meaning no network cards were found. The test may detect other issues such as electrical interference (noise), circuitry damage, loose connectors, and crimped or bad network cables.

The Network Test will test DSL or cable internet connections, which operate within a network environment. However, this test does not test the DSL or cable modem used for accessing the Internet. Currently, no PC-Doctor test exists for testing cable or DSL modems.

The Network Communications Test checks if your PC's network card works and if your PC properly communicates over a network. It makes a list of all the remote PCs on the network that the NIC uses and sends information in the form of several "data packets" from the tested PC to the "host" PCs. These "data packets" are then returned by the "host" PCs to the tested PC where the contents of the "data packet" are checked. If too many of the "data packets" fail to get returned or are thrown away because of data corruption, the Network test logs as FAILED.

For test procedure instructions, see the *Network Test* section, page 7-125.

Section 7-3
Performing Full System Diagnostics

When performing the automatic Full System Diagnostic tests, it is strongly recommended to start with the **Full System Test (FE and BEP)** - especially if the Vivid-i™ system shows signs of an intermittent problem. As described in this section, the testing sequence can be paused and restarted at any stage, providing a quick and easy method of reviewing any detected faults.

The different types of Full System Diagnostic Tests are described in detail in the *Diagnostic Test Window Menu Options* section, on page 7-9. For instructions on performing each of these tests, refer to the following information:

- Full System Test (FE and BEP) on page 7 - 19

7-3-1 Accessing the Full System Diagnostic Options

- In 2D-Mode, press **<ALT +Config>** on the alphanumeric keyboard. The *Diagnostic Test* window is displayed, as shown in Figure 7-1 on page 7-3.

7-3-1-1 Full System Test (FE and BEP)

NOTE: For a description of this test, refer to the Full System Test (FE and BEP) on page 7 - 9.

NOTE: The Full System Test (FE and BEP) performs a full sequence of complete system tests (automatically) and requires approximately 10 minutes for completion.

1.) In the *Diagnostic Test* window, trackball to **Full System Test (FE and BEP)** in the list of tests available for selection from the Diagnostic Test Tree (see Figure 7-4 below) and press **Set**. The Full System Test (FE and BEP) name is displayed under *Execute*, and all system components are highlighted blue in the Schematic View, as shown below:

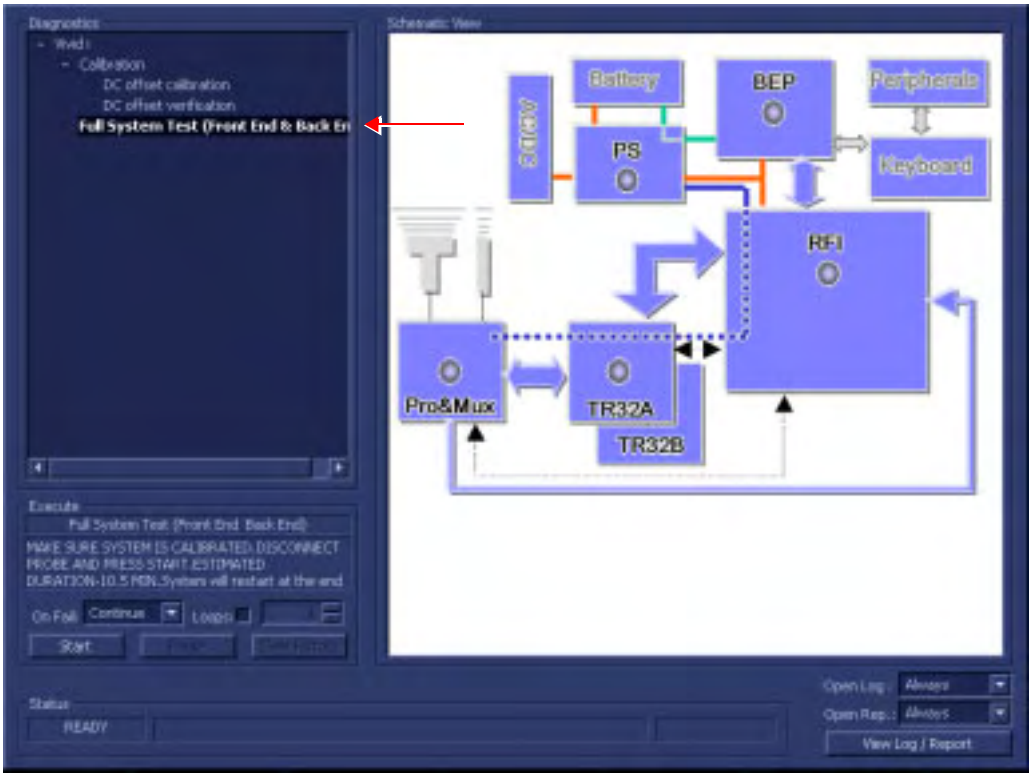


Figure 7-4 Full System (FE and BEP) Test

2.) As indicated in the *Special Instructions* area, make sure the system is calibrated and disconnect any probe currently connected to the system.

3.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.

4.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

5.) Trackball to the **Start** button and press **Set**.

The Automatic Test Sequence commences. While the sequence of automatic testing or the group of tests proceeds, the name of the test currently in progress (Full System Test FE and BEP) is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bars in the *Status* area:

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

6.) At any stage, trackball to the **Pause** button and press **Set**, if required.

7.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the Full System Test (FE and BEP) sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests passed or failed, as shown in the example in Figure 7-5.

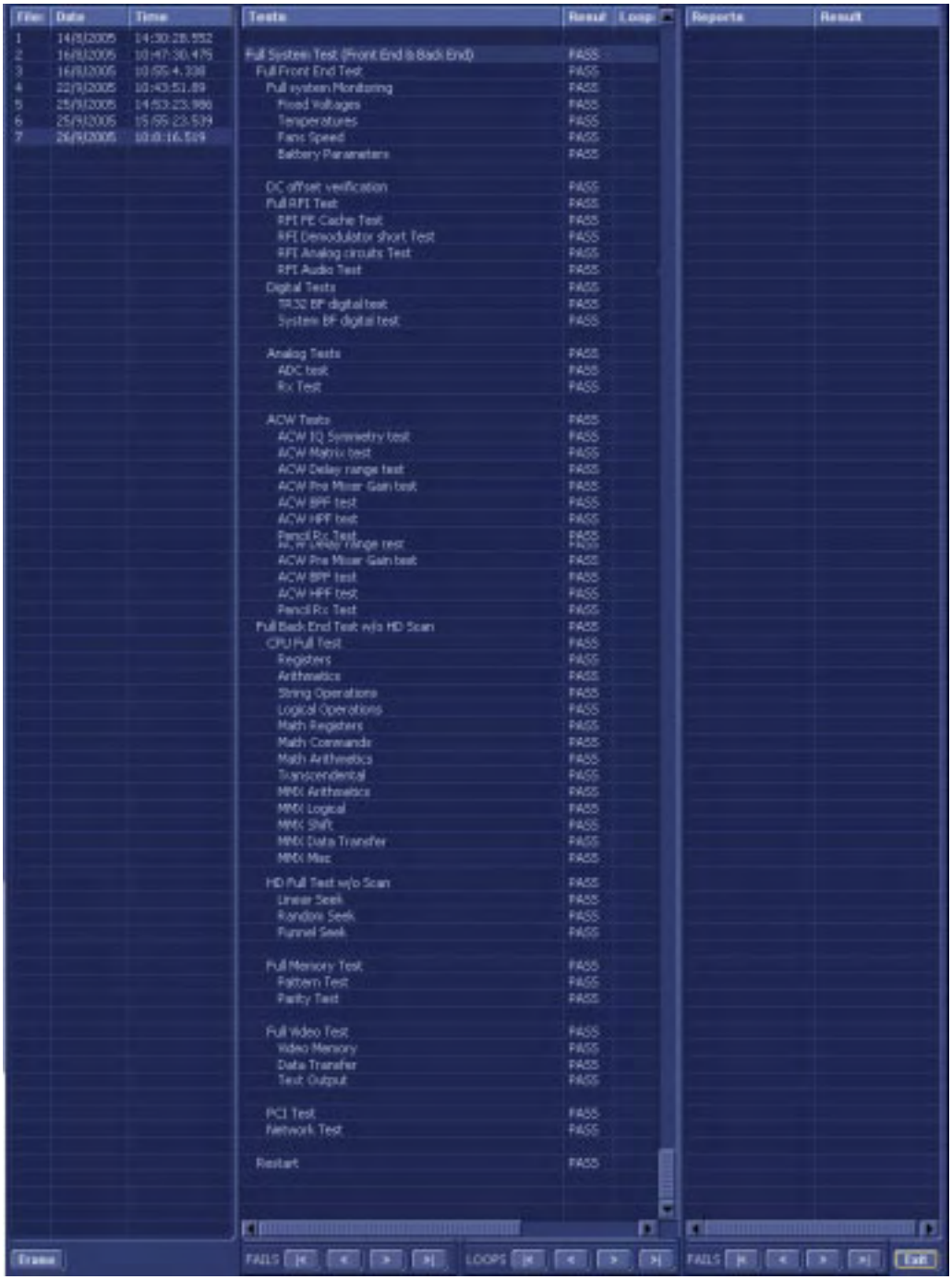


Figure 7-5 View Test Log - Full System Test (BEP and FE)

8.) If necessary, use the scroll bars and/or arrows to scroll through the list of *Test* results.

9) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified but the results were marginal, perform calibration, as described in DC Offset Calibration on page 7 - 24, and then repeat the test.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory)*.

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of that board is faulty. Contact your local GE medical systems field engineer for assistance.

10.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

11.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

NOTE:

NOTE:

Section 7-4
Performing Front End (FE) Diagnostics

*NOTE: When performing Front End Diagnostic tests, it is strongly recommended to start with the **Full System Test (FE and BEP)** especially if the system shows signs of an intermittent problem. (For details, see Full System Test (FE and BEP) on page 7 - 19).*

The Front End diagnostic tests can be initiated manually and may be performed in any order. However, due to the functional dependencies between each of the Front End boards, it is recommended to perform the tests on the boards in the following order:

1.) RFI board

2.) TR32 boards

3.) PM board

Performing the tests in the proper sequence will help to derive the correct conclusions regarding the source of the problem.

As described in this section, the testing sequence can be paused and restarted at any stage, providing a quick and easy method of reviewing any detected faults. For instructions on performing a specific test, refer to the relevant test in the appropriate sub-sections:

- **Calibration Tests**, as described in the *Calibration Tests* section, on page 7-24.
- **RFI Diagnostic Tests**, as described in the *Radio Frequency Interface (RFI) Diagnostic Tests* section, on page 7-30.
- **TR 32 Diagnostic Tests**, as described in the *TR 32 Diagnostic Tests* section, on page 7-45.
- **Probe & MUX Diagnostic Tests**, as described in the *Probe and MUX Diagnostic Tests* section, on page 7-60.

NOTE: If the system must be re-booted, do so. Continue testing from the point at which you were required to reboot. If a failure occurs, re-boot the system and test again to verify the outcome of the test.

7-4-1 Accessing the Front End Diagnostic Options

- In 2D-Mode, press **<ALT +Config>** on the alphanumeric keyboard. The *Diagnostic Test* window is displayed, as shown in Figure 7-1 on page 7-3.

7-4-2 Calibration Tests

7-4-2-1 DC Offset Calibration

NOTE: For a description of this test, refer to the information provided in DC Offset Calibration on page 7 - 10.

NOTICE **IMPORTANT** In order to access an individual board test, it is necessary to insert the service dongle from system boot-up and enter the Service Password.

NOTE: When performing this test, no probe should be connected to the system and nothing should be touching the probe connectors!

1.) In the *Diagnostic Test* window, trackball to **DC Offset Calibration** in the list of *Front End* tests available for selection from the Diagnostic Test Tree (see Figure 7-6 below) and press **Set**. The DC Offset Calibration name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (PM, TR32 and RFI boards) as shown below:

Figure 7-6 DC Offset Calibration Test

2.) As indicated in the *Special Instructions* area, disconnect any probes currently connected to the system and make sure that nothing is touching the probe connectors.

3.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.

4.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

5.) Trackball to the **Start** button and press **Set**.

The DC Offset Calibration Test commences. While the test proceeds, the name of the test currently in progress (DC Offset Calibration) is displayed in the *Execute* field and the current *Loop* # and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area:

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

6.) At any stage, trackball to the **Pause** button and press **Set**, if required.

7.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the DC Offset Calibration Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing the test performed and showing whether it passed or failed, as shown in the example in Figure 7-7.

Figure 7-7 View Test Log - DC Offset Calibration

Note: There is one test report (ADC Offset values) which is listed in the *Reports* window on the right. By default, this report is displayed in the Reports window below.

8.) Use the scroll arrows at the bottom of the Reports window (see Figure 7-7) to scroll through the channels and view the corresponding results.

9) When done, trackball to the **Close** button and press **Set** to close the View Report window.

10) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified but the results were marginal, perform calibration, as described in DC Offset Calibration on page 7 - 24, and then repeat the test.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory).*

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of that board is faulty. Contact your local GE medical systems field engineer for assistance.

11.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

12.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-4-2-2 DC Offset Verification

NOTE: For a description of this test, refer to the information provided in DC Offset Verification on page 7 - 10.

NOTICE **IMPORTANT** In order to access an individual board test, it is necessary to insert the service dongle from system boot-up and enter the Service Password.

NOTE: When performing this test, no probe should be connected to the system and nothing should be touching the probe connectors!

1.) In the *Diagnostic Test* window, trackball to **CD Offset Verification** in the list of tests available for selection from the Diagnostic Test Tree (see Figure 7-8 below) and press **Set**. The CD Offset Verification name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (PM, TR32 and RFI boards), as shown below:

Figure 7-8 CD Offset Verification Test

2.) As indicated in the *Special Instructions* area, disconnect any probes currently connected to the system and make sure that nothing is touching the probe connectors.

3.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.

4.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

5.) Trackball to the **Start** button and press **Set**.

The CD Offset Verification Test commences. While the test proceeds, the name of the test currently in progress (CD Offset Verification) is displayed in the *Execute* field and the current *Loop* # and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

6.) At any stage, trackball to the **Pause** button and press **Set**, if required.

7.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the CD Offset Verification Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests passed or failed, as shown in the example in Figure 7-9.

Figure 7-9 View Test Log - CD Offset Verification Test

8.) If necessary, use the scroll bars and/or arrows to scroll through the list of Test results.

Note: For this test, there is one report (ADC Offset verification values) which is listed in the *Reports* window on the right. By default, this report is displayed in the Reports window below.

9.) Use the scroll arrows at the bottom of the Reports window (see Figure 7-9) to scroll through the channels and view the corresponding results.

10) When done, trackball to the **Close** button and press **Set** to close the View Report window.

11) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified but the results were marginal, perform calibration, as described in DC Offset Calibration on page 7 - 24, and then repeat the test.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory).*

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of this board is faulty. Contact your local GE medical systems field engineer for assistance.

12.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

13.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-4-3 Radio Frequency Interface (RFI) Diagnostic Tests

7-4-3-1 Accessing the RFI Diagnostic Test Options

- Access the *Diagnostic Test* window, as described in the *Accessing the Front End Diagnostic Options* section, on page 7-24.

7-4-3-2 Full RFI Test

NOTE: For a description of this test, refer to the information provided in Full RFI Test on page 7 - 10.

NOTICE **IMPORTANT** In order to access an individual board test, it is necessary to insert the service dongle from system boot-up and enter the Service Password.

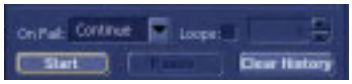
NOTE: When performing this test, no probe should be connected to the system and nothing should be touching the probe connectors!

1.) In the *Diagnostic Test* window, trackball to **Full RFI Test** in the list of *RFI* tests available for selection from the Diagnostic Test Tree (see Figure 7-10 below) and press **Set**. The Full RFI Test name is displayed under *Execute;* the relevant system component to be tested is highlighted light blue in the Schematic View (RFI), as shown below:

Figure 7-10 Full RFI Test

2.) As indicated in the *Special Instructions* area, disconnect any probes currently connected to the system and make sure that nothing is touching the probe connectors.

3.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.



4.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

5.) Trackball to the **Start** button and press **Set**.

The Full RFI Test commences. While the test proceeds, the name of the test currently in progress (Full RFI Test) is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area:

As the testing sequence progresses, the progress bar will advance to reflect the test progress. The LED on the RFI status indicator in the Data Flow map will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

6.) At any stage, trackball to the **Pause** button and press **Set**, if required.

7.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the Full RFI Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests passed or failed, as shown in the example in the example in Figure 7-11.

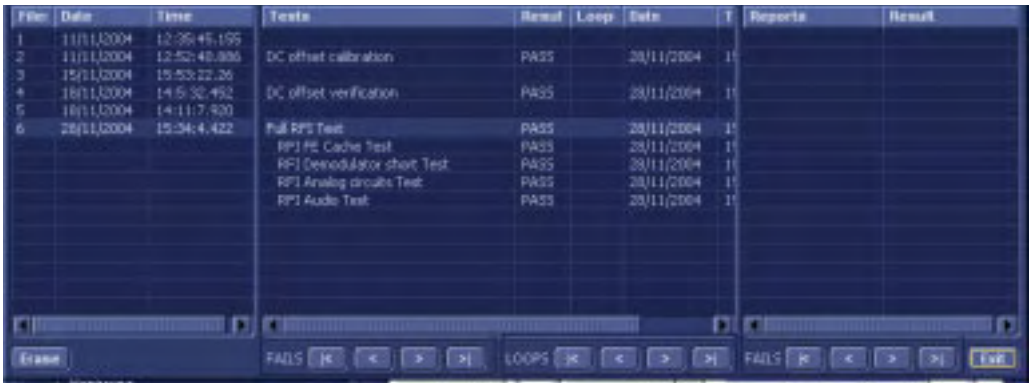


Figure 7-11 View Test Log - Full RFI Test

8.) If necessary, use the scroll bars and/or arrows to scroll through the list of *Test* results.

Note: For the Full RFI test, four tests are performed in the test sequence; these are listed in the Tests window as shown in Figure 7-11. For each currently-selected test (for example, *RFI FE Cache Test*) the corresponding report is listed in *Reports* on the right.
For details of each report, refer to the following explanations:

- View Test Log - RFI Cache Test on page 7 - 34
- View Test Log - RFI Demodulator Short Test on page 7 - 40
- View Test Log - RFI Analog Circuits Test on page 7 - 37
- View Test Log - RFI Audio Test on page 7 - 43

9) When done, trackball to the **Exit** button and press **Set** to close the View Report window.

10) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified but the results were marginal, perform calibration, as described in DC Offset Calibration on page 7 - 24, and then repeat the test.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory)*.

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of that board is faulty. Contact your local GE medical systems field engineer for assistance.

11.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

12.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-4-3-3 RFI FE Cache Test

NOTE: For a description of this test, refer to the information provided in RFI FE Cache Test on page 7 - 10.

NOTICE **IMPORTANT** In order to access an individual board test, it is necessary to insert the service dongle from system boot-up and enter the Service Password.

NOTE: When performing this test, no probe should be connected to the system and nothing should be touching the probe connectors!

1.) In the *Diagnostic Test* window, trackball to **RFI FE Cache Test** in the list of *RFI* tests available for selection from the Diagnostic Test Tree (see Figure 7-8 below) and press **Set**. The RFI FE Cache Test name is displayed under *Execute;* the relevant system component to be tested remain highlighted light blue in the Schematic View (RFI), as shown below:

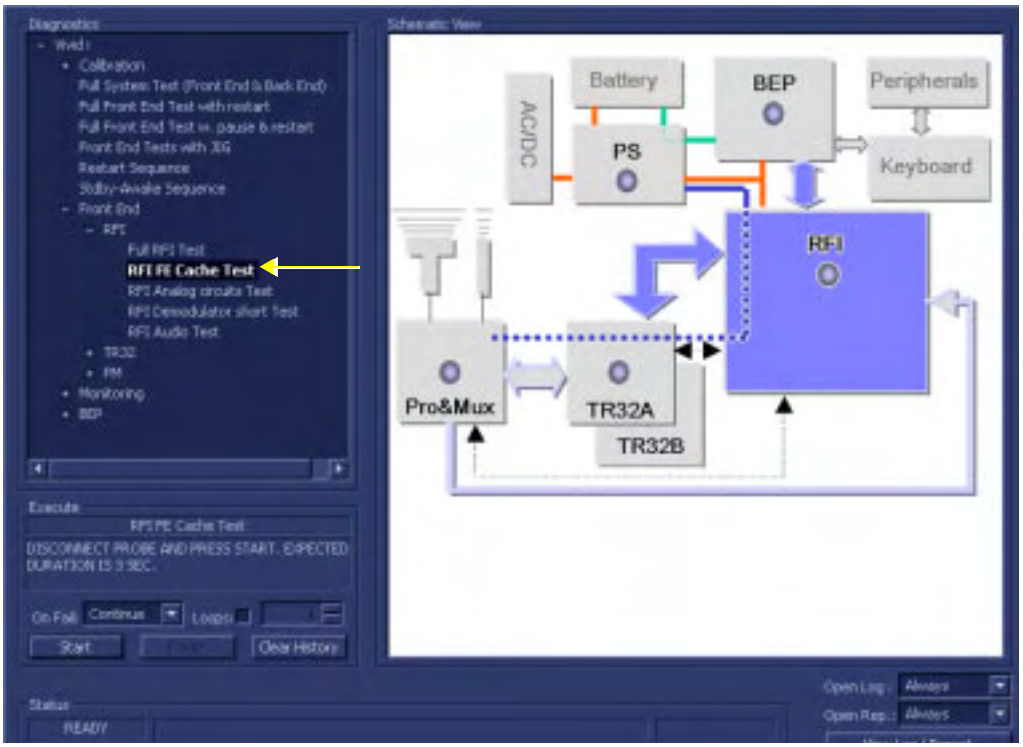


Figure 7-12 RFI FE Cache Test

2.) As indicated in the *Special Instructions* area, disconnect any probes currently connected to the system and make sure that nothing is touching the probe connectors.

3.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.

4.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

5.) Trackball to the **Start** button and press **Set**.

The RFI FE Cache Test commences. While the test proceeds, the name of the test currently in progress (RFI FE Cache Test) is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area:

As the testing sequence progresses, the progress bar will advance to reflect the test progress. The LED on the RFI status indicator in the Data Flow map will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

6.) At any stage, trackball to the **Pause** button and press **Set**, if required.

7.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the RFI FE Cache Test sequence is complete

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests passed or failed, as shown in the example in Figure 7-13.

8.) If necessary, use the scroll bars and/or arrows to scroll through the list of Test results.

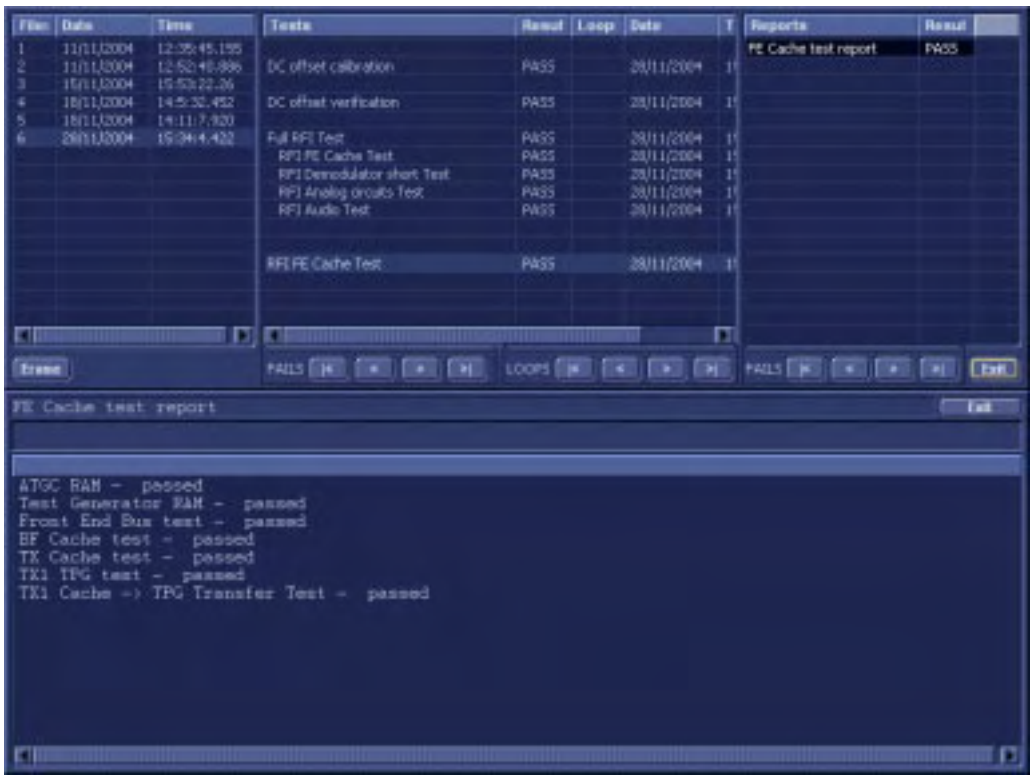


Figure 7-13 View Test Log - RFI Cache Test

Note: For this test, there is one report (FE Cache Test report) which is listed in the *Reports* window on the right. By default, this report is displayed in the Reports window below.

9) When done, trackball to the **Exit** button and press **Set** to close the View Report window.

10) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified but the results were marginal, perform calibration, as described in DC Offset Calibration on page 7 - 24, and then repeat the test.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory)*.

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of that board is faulty. Contact your local GE medical systems field engineer for assistance.

11.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

12.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-4-3-4 RFI Analog Circuits Test

NOTE: For a description of this test, refer to the information provided in RFI Analog Circuits Test on page 7 - 10.

NOTICE **IMPORTANT** In order to access an individual board test, it is necessary to insert the service dongle from system boot-up and enter the Service Password.

NOTE: When performing this test, no probe should be connected to the system and nothing should be touching the probe connectors!

1.) In the *Diagnostic Test* window, trackball to **RFI Analog Circuits Test** in the list of *RFI* tests available for selection from the Diagnostic Test Tree (see Figure 7-14 below) and press **Set**. The RFI Analog Circuits Test name is displayed under *Execute;* the relevant system component to be tested are highlighted light blue in the Schematic View (RFI) , as shown below:

Figure 7-14 RFI Analog Circuits Test

2.) As indicated in the *Special Instructions* area, disconnect any probes currently connected to the system and make sure that nothing is touching the probe connectors.

3.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.

4.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

5.) Trackball to the **Start** button and press **Set**.

The RFI Analog Circuits Test commences. While the test proceeds, the name of the test currently in progress is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area:

As the testing sequence progresses, the progress bar will advance to reflect the test progress. The LED on the RFI status indicator in the Data Flow map will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

6.) At any stage, trackball to the **Pause** button and press **Set**, if required.

7.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the RFI Analog Circuits Test sequence is complete,

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests passed or failed, as shown in the example in Figure 7-15.

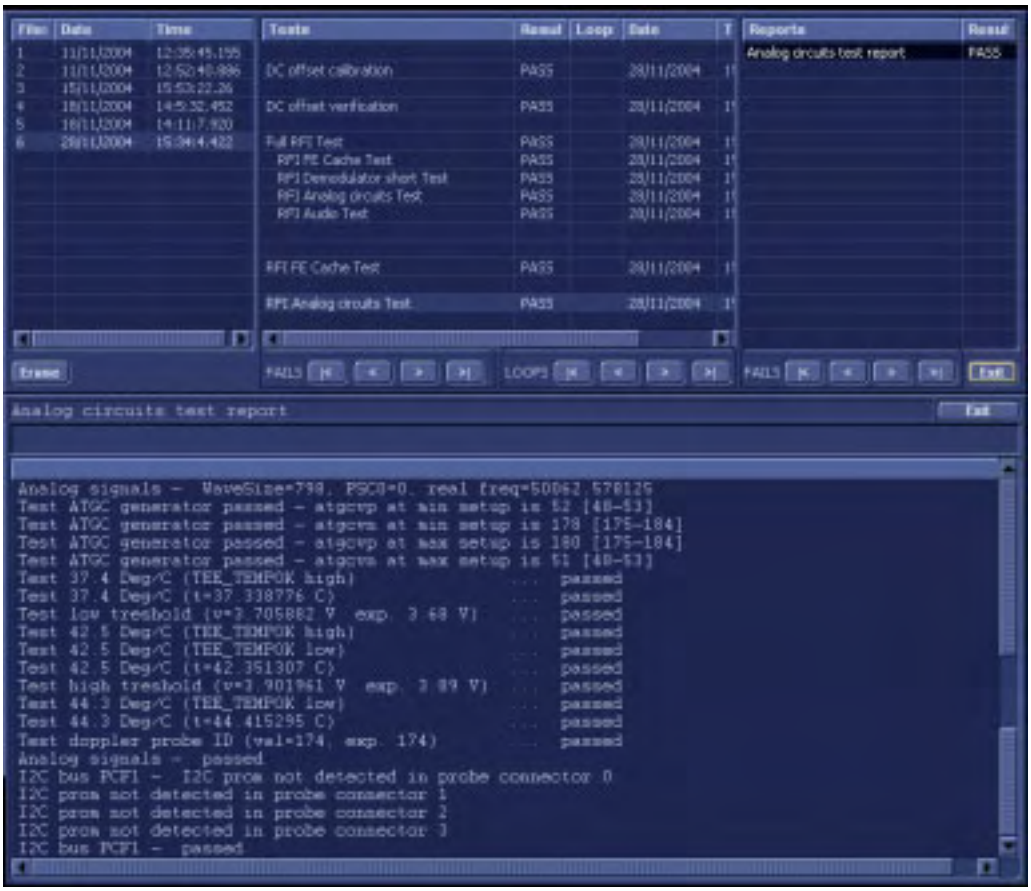

Analog circuits test report
Analog signals - WaveSize=798, PSC0=0, real freq=50062.570126
Test ATGC generator passed - atgcvp at min setup is 52 [48-53]
Test ATGC generator passed - atgcvm at min setup is 178 [175-184]
Test ATGC generator passed - atgcvp at max setup is 180 [175-184]
Test ATGC generator passed - atgcvm at max setup is 51 [48-53]
Test 37.4 Deg/C (TEE_TEMPOK high) ... passed
Test 37.4 Deg/C (t=37.338776 C) ... passed
Test low treshold (v=2.705882 V exp. 2.68 V) ... passed
Test 42.5 Deg/C (TEE_TEMPOK high) ... passed
Test 42.5 Deg/C (TEE_TEMPOK low) ... passed
Test 42.5 Deg/C (t=42.351307 C) ... passed
Test high treshold (v=3.901961 V exp. 3.89 V) ... passed
Test 44.3 Deg/C (TEE_TEMPOK low) ... passed
Test 44.3 Deg/C (t=44.415295 C) ... passed
Test doppler probe ID (val=174, exp. 174) ... passed
Analog signals - passed
I2C bus PCF1 - I2C prom not detected in probe connector 0
I2C prom not detected in probe connector 1
I2C prom not detected in probe connector 2
I2C prom not detected in probe connector 3
I2C bus PCF1 - passed

Figure 7-15 View Test Log - RFI Analog Circuits Test

8.) If necessary, use the scroll bars and/or arrows to scroll through the list of *Test* results.

Note: For this test, there is one report (Analog Circuits Test report) which is listed in *Reports* on the right. By default, this report is displayed in the Reports window below (Figure 7-15). Use the Report window scroll bars and/or arrows to scroll through complete report if necessary.

9) When done, trackball to the **Exit** button and press **Set** to close the View Report window.

10) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified but the results were marginal, perform calibration, as described in DC Offset Calibration on page 7 - 24, and then repeat the test.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory)*.

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of that board is faulty. Contact your local GE medical systems field engineer for assistance.

11.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

12.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-4-3-5 RFI Demodulator Short Test

NOTE: For a description of this test, refer to the information in RFI Demodulator Short Test on page 7 - 10.

NOTICE **IMPORTANT** In order to access an individual board test, it is necessary to insert the service dongle from system boot-up and enter the Service Password.

NOTE: When performing this test, no probe should be connected to the system and nothing should be touching the probe connectors!

1.) In the *Diagnostic Test* window, trackball to **RFI Demodulator Short Test** in the list of *RFI* tests available for selection from the Diagnostic Test Tree (see Figure 7-16 below) and press **Set**. The RFI Demodulator Short Test name is displayed under *Execute;* the relevant system component to be tested are highlighted light blue in the Schematic View (RFI) , as shown below:

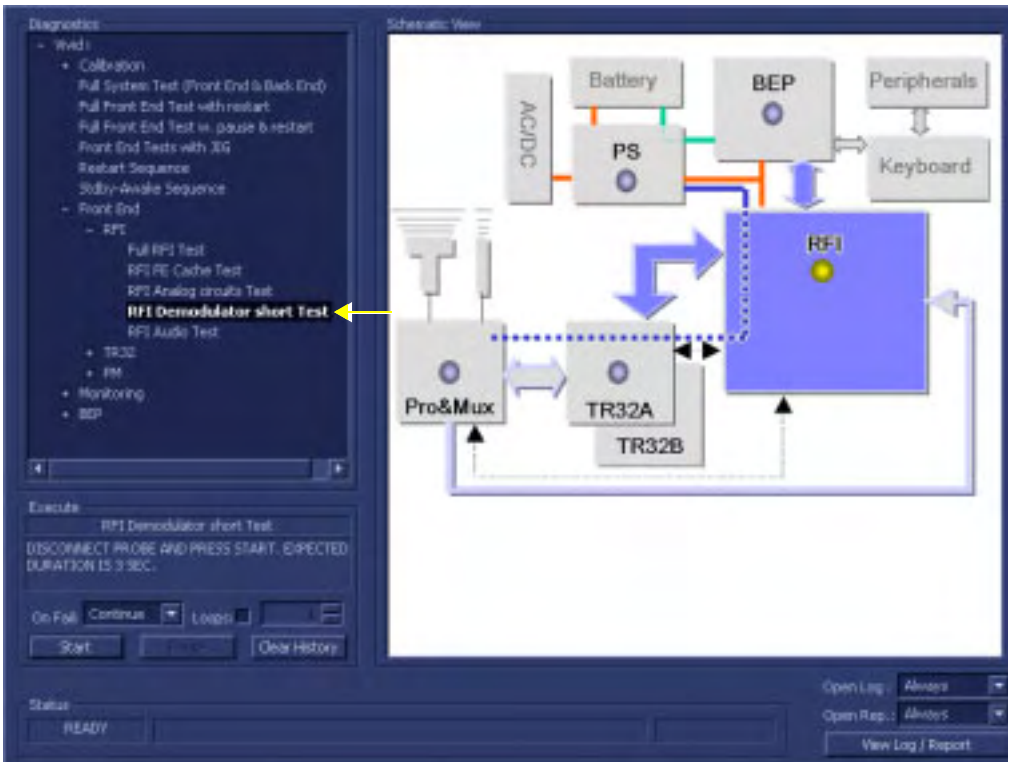


Figure 7-16 RFI Demodulator Short Test

2.) As indicated in the *Special Instructions* area, disconnect any probes currently connected to the system and make sure that nothing is touching the probe connectors.

3.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.

4.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

5.) Trackball to the **Start** button and press **Set**.

The RFI Demodulator Short Test commences. While the test proceeds, the name of the test currently in progress is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area:

As the testing sequence progresses, the progress bar will advance to reflect the test progress. The LED on the RFI status indicator in the Data Flow map will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

6.) At any stage, trackball to the **Pause** button and press **Set**, if required.

7.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the RFI Demodulator Short Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests passed or failed, as shown in the example in Figure 7-17.

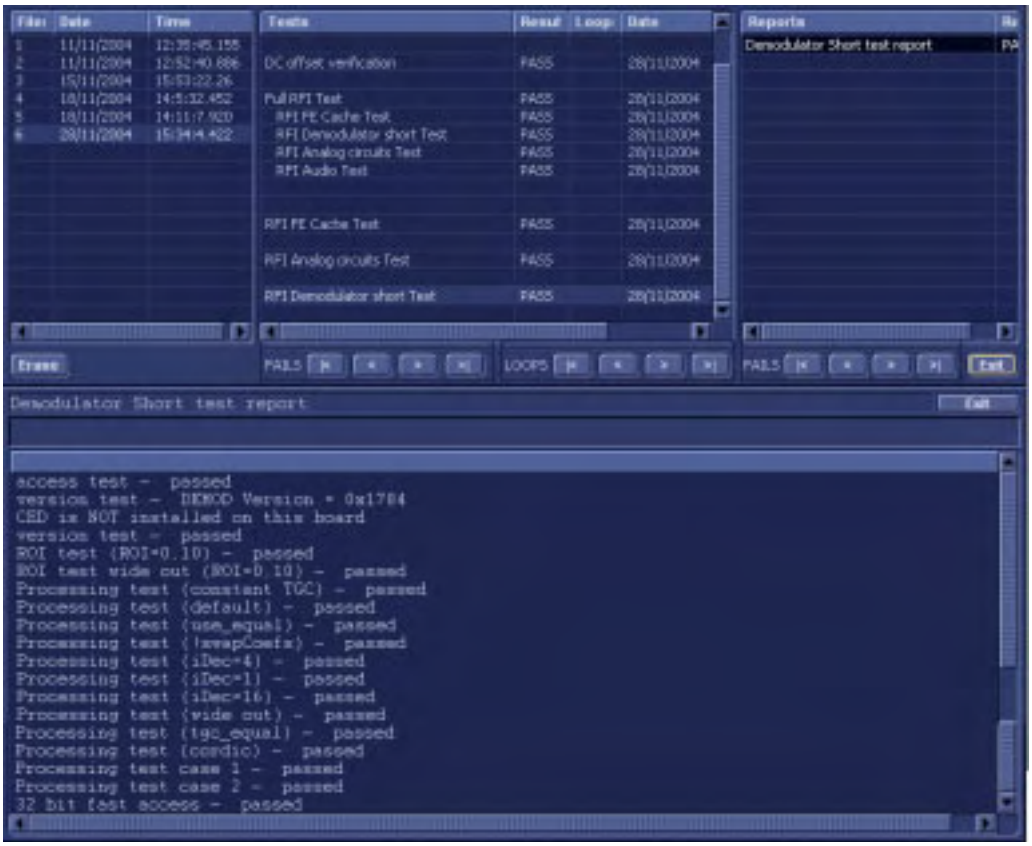

Demodulator Short test report
access test - passed
version test - DEMOD Version = 0x1704
CED is NOT installed on this board
version test - passed
ROI test (ROI=0,10) - passed
ROI test wide out (ROI=0,10) - passed
Processing test (constant TGC) - passed
Processing test (default) - passed
Processing test (use_equal) - passed
Processing test (!swapCoefs) - passed
Processing test (iDec=4) - passed
Processing test (iDec=1) - passed
Processing test (iDec=16) - passed
Processing test (wide out) - passed
Processing test (tgc_equal) - passed
Processing test (cordic) - passed
Processing test case 1 - passed
Processing test case 2 - passed
32 bit fast access - passed

Figure 7-17 View Test Log - RFI Demodulator Short Test

8.) If necessary, use the scroll bars and/or arrows to scroll through the list of *Test* results.

Note: For this test, there is one report (Demodulator Short Test report) which is listed in the *Reports* window on the right. By default, this report is displayed in the Reports window below (Figure 7-17). Use the Report window scroll bars and/or arrows to scroll through complete report if necessary.

9) When done, trackball to the **Exit** button and press **Set** to close the View Report window.

10) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).

- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified but the results were marginal, perform calibration, as described in DC Offset Calibration on page 7 - 24, and then repeat the test.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory)*.

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of that board is faulty. Contact your local GE medical systems field engineer for assistance.

11.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

12.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-4-3-6 RFI Audio Test

NOTE: For a description of this test, refer to the information provided in RFI Audio Test on page 7 - 10.

NOTICE **IMPORTANT** In order to access an individual board test, it is necessary to insert the service dongle from system boot-up and enter the Service Password.

NOTE: When performing this test, no probe should be connected to the system and nothing should be touching the probe connectors!

1.) In the *Diagnostic Test* window, trackball to **RFI Audio Test** in the list of *RFI* tests available for selection from the Diagnostic Test Tree (see Figure 7-8 below) and press **Set**. The RFI Audio Test name is displayed under *Execute;* the relevant system component to be tested is highlighted light blue in the Schematic View (RFI) , as shown below:

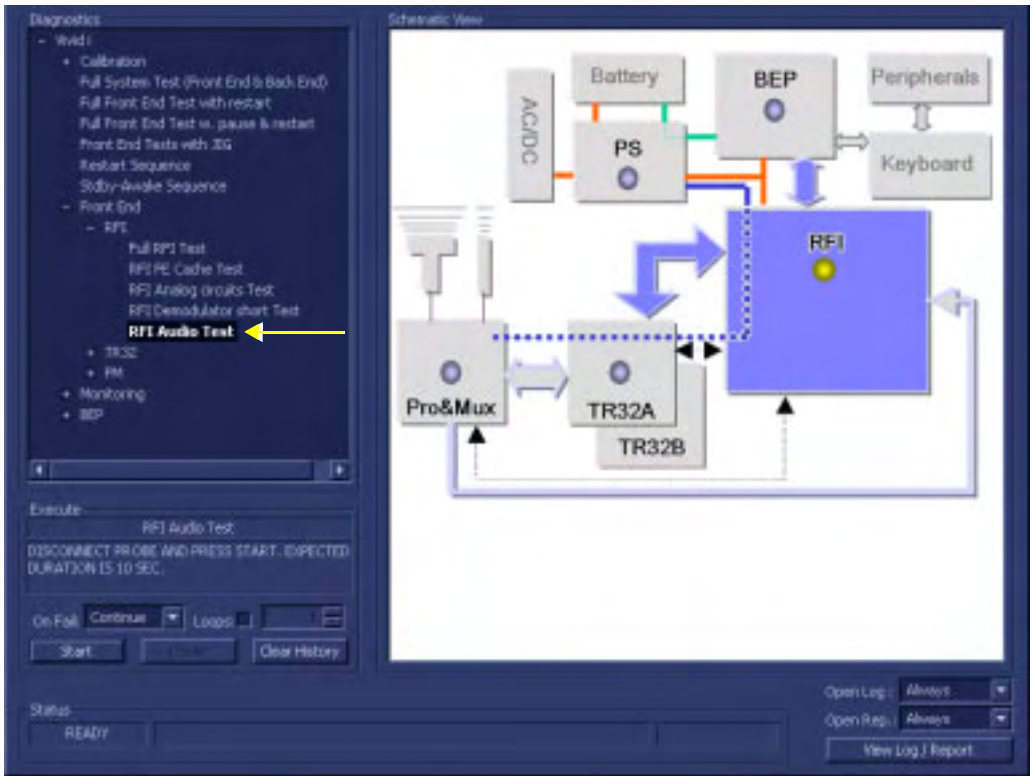


Figure 7-18 RFI Audio Test

2.) As indicated in the *Special Instructions* area, disconnect any probes currently connected to the system and make sure that nothing is touching the probe connectors.

3.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.

4.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

5.) Trackball to the **Start** button and press **Set**.

The RFI Audio Test commences. While the test proceeds, the name of the test currently in progress is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area:

As the testing sequence progresses, the progress bar will advance to reflect the test progress. The LED on the RFI status indicator in the Data Flow map will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

When the *upper* progress bar reaches approximately midway in the *Status* area, a loud, high-pitched sound will be heard coming from the speakers.

Note: If no sound is heard, it is necessary to perform the BEP Audio Test as described in Audio Test on page 7 - 147. In the event this test also fails, the problem is probably in the BEP - refer to Performing Back End Diagnostics on the System on page 7 - 109.

6.) At any stage, trackball to the **Pause** button and press **Set**, if required.

7.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the RFI Audio Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests passed or failed, as shown in the example in Figure 7-19.

Figure 7-19 View Test Log - RFI Audio Test

Note: For this test, this one report (Demodulator Short Test report) which is listed in the *Reports* window on the right. By default, this report is displayed in the Reports window below, as shown in the example in Figure 7-19.

8) When done, trackball to the **Exit** button and press **Set** to close the View Report window.

9) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified but the results were marginal, perform calibration, as described in DC Offset Calibration on page 7 - 24, and then repeat the test.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory).*

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of that board is faulty. Contact your local GE medical systems field engineer for assistance.

7-4-4 TR 32 Diagnostic Tests

NOTE: The TR32 Diagnostic Tests are used to perform functional testing of both the TR32A and TR32 boards.

7-4-4-1 Accessing the TR32 Diagnostic Test Options

- Access the *Diagnostic Test* window, as described in the *Accessing the Front End Diagnostic Options* section, on page 7-24.

7-4-4-2 Beamformer Tests

7-4-4-2-1 TR32 BF Digital Test

NOTE: For a description of this test, refer to the information in TR32 BF Digital Test on page 7 - 11.

NOTICE **IMPORTANT** In order to access an individual board test, it is necessary to insert the service dongle from system boot-up and enter the Service Password.

NOTE: When performing this test, no probe should be connected to the system and nothing should be touching the probe connectors!

1.) In the *Diagnostic Test* window, trackball to **TR32 BF Digital Test** in the list of *TR32, BF* tests available for selection from the Diagnostic Test Tree (see Figure 7-20 below) and press **Set**. The TR32 BF Digital Test name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (TR32A and TR32B), as shown below:

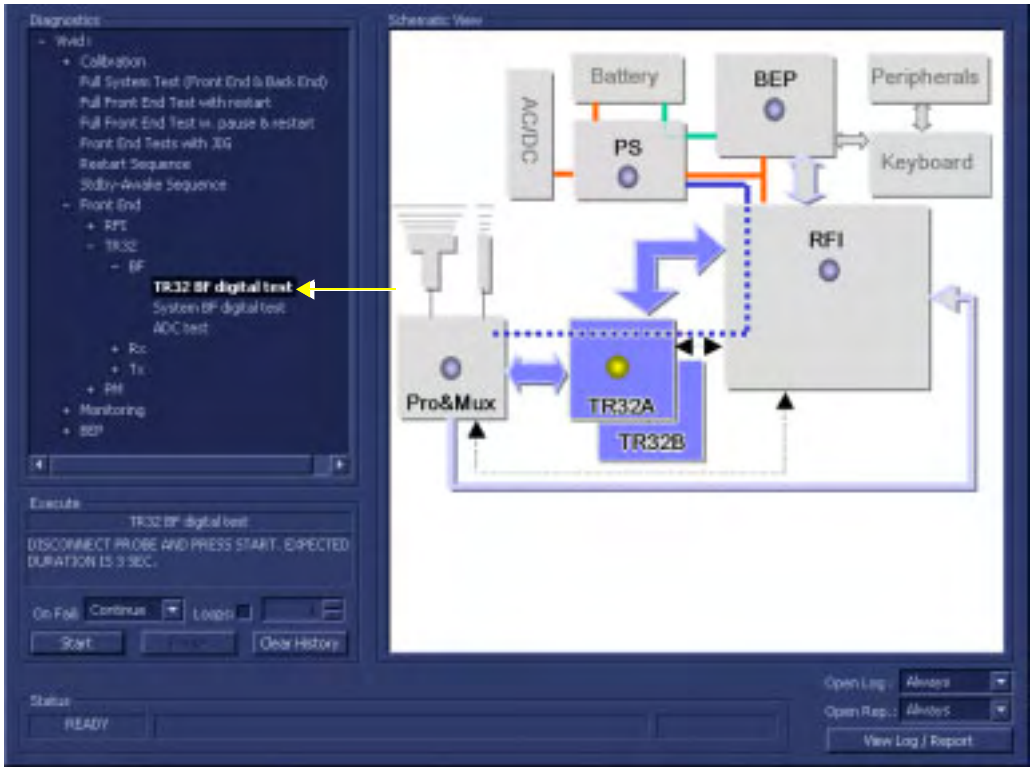


Figure 7-20 TR32 BF Digital Test

2.) As indicated in the *Special Instructions* area, disconnect any probes currently connected to the system and make sure that nothing is touching the probe connectors.

3.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.

4.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

5.) Trackball to the **Start** button and press **Set**.

The TR32 BF Digital Test **c**ommences. While the test proceeds, the name of the test currently in progress is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area:

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

6.) At any stage, trackball to the **Pause** button and press **Set**, if required.

7.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the TR32 BF Digital Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests passed or failed, as shown in the example in Figure 7-21.

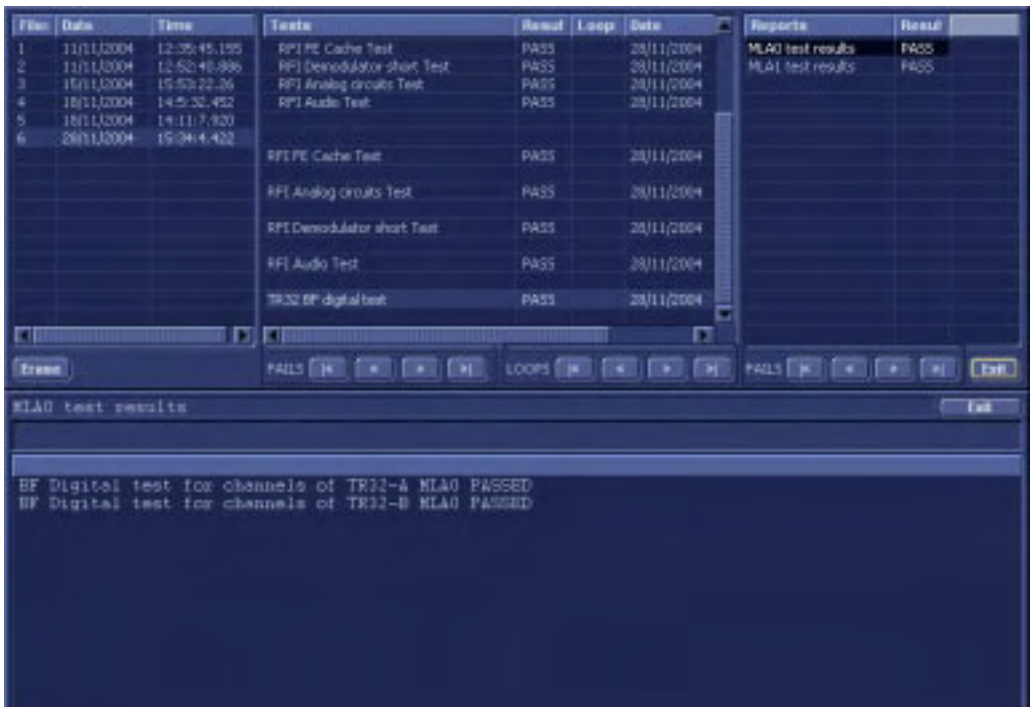


Figure 7-21 View Test Log - TR32 BF Digital Test (MLA0)

8.) If necessary, use the scroll bars and/or arrows to scroll through the list of *Test* results.

Note: For this test, there are two reports (MLA0 and MLA1) which is listed in *Reports* on the right. By default, the MLA0 report is displayed in the Reports window below, showing the results for both the TR32A and TR32B boards (Figure 7-21).

9.) To view the MLA1 test results in the Report window, select MLA1 test results under *Reports*.

The MLA1 report is displayed in the Reports window below:

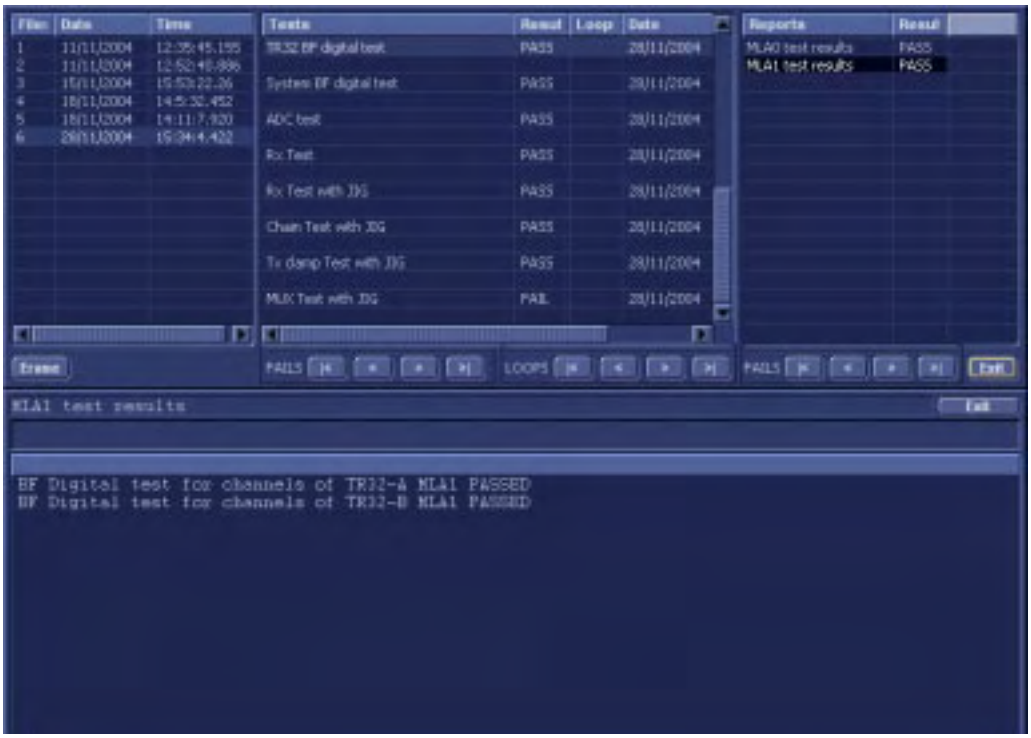


Figure 7-22 View Test Log - TR32 BF Digital Test (MLA1)

10) When done, trackball to the **Exit** button and press **Set** to close the View Report window.

11) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified but the results were marginal, perform calibration, as described in DC Offset Calibration on page 7 - 24, and then repeat the test.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory).*

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of that board is faulty. Contact your local GE medical systems field engineer for assistance.

12.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

13.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-4-4-2-2 System BF Digital Test

NOTE: For a description of this test, refer to the information in System BF Digital Test on page 7 - 11.

NOTICE **IMPORTANT** In order to access an individual board test, it is necessary to insert the service dongle from system boot-up and enter the Service Password.

NOTE: When performing this test, no probe should be connected to the system and nothing should be touching the probe connectors!

1.) In the *Diagnostic Test* window, trackball to **System BF Digital Test** in the list of *TR32, BF* tests available for selection from the Diagnostic Test Tree (see Figure 7-8 below) and press **Set**. The System BF Digital Test name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (TR32A. TR32B) , as shown below:

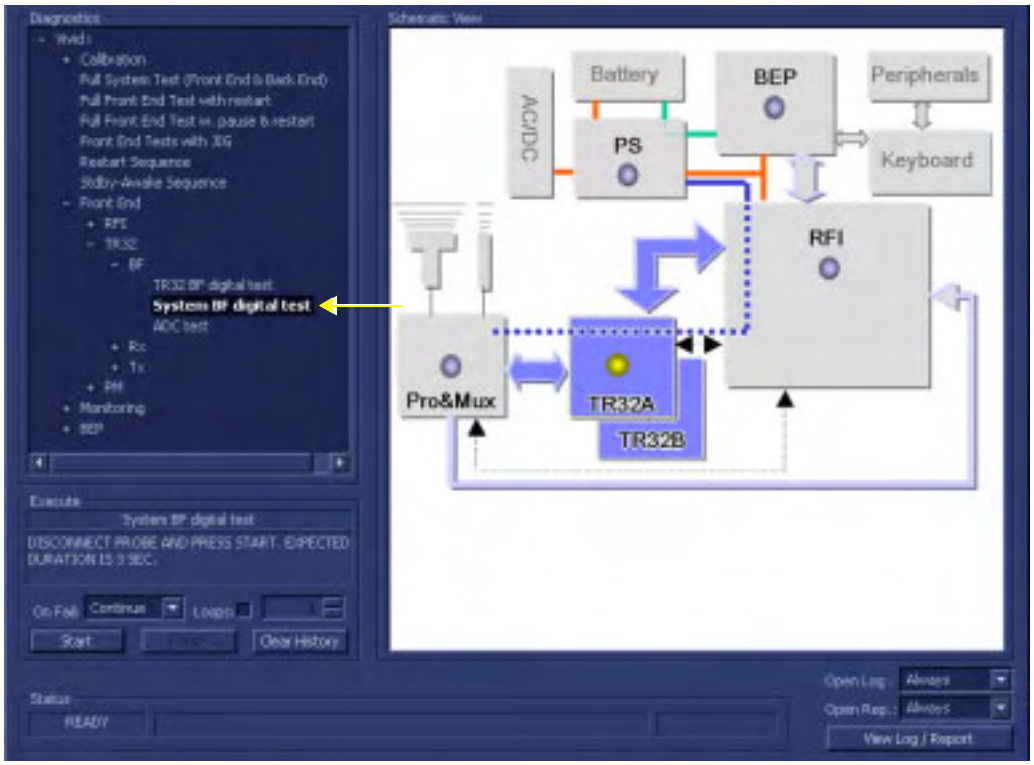


Figure 7-23 System BF Digital Test

2.) As indicated in the *Special Instructions* area, disconnect any probes currently connected to the system and make sure that nothing is touching the probe connectors.

3.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.

4.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

5.) Trackball to the **Start** button and press **Set**.

The System BF Digital Test commences. While the test proceeds, the name of the test currently in progress (System BF Digital Test) is displayed in the *Execute* field and the current *Loop* # and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

6.) At any stage, trackball to the **Pause** button and press **Set**, if required.

7.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the System BF Digital Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests passed or failed, as shown in the example in Figure 7-24.

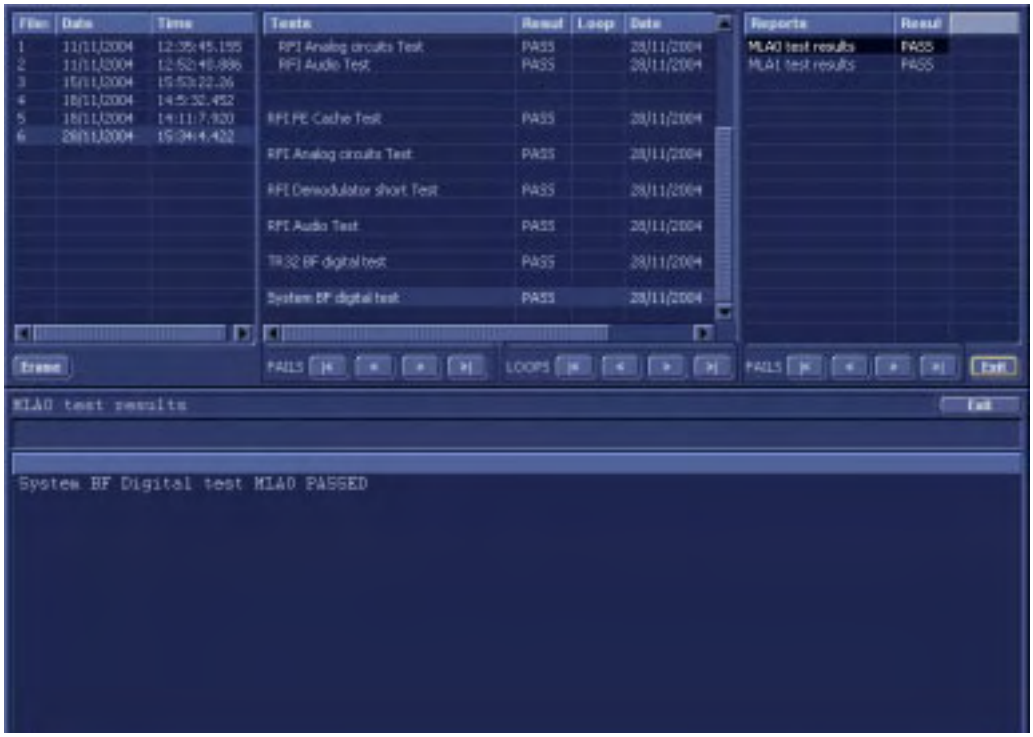


Figure 7-24 View Test Log - System BF Digital Test (MLA0)

8.) If necessary, use the scroll bars and/or arrows to scroll through the list of *Test* results.

Note: For this test, there are two reports (MLA0 and MLA1) which is listed in *Reports* on the right. By default, the MLA0 report is displayed in the Reports window below (Figure 7-24).

9.) To view the MLA1 test results, select MLA1 test results under *Reports*.

The MLA1 test results are displayed in the Report Window, as shown below.

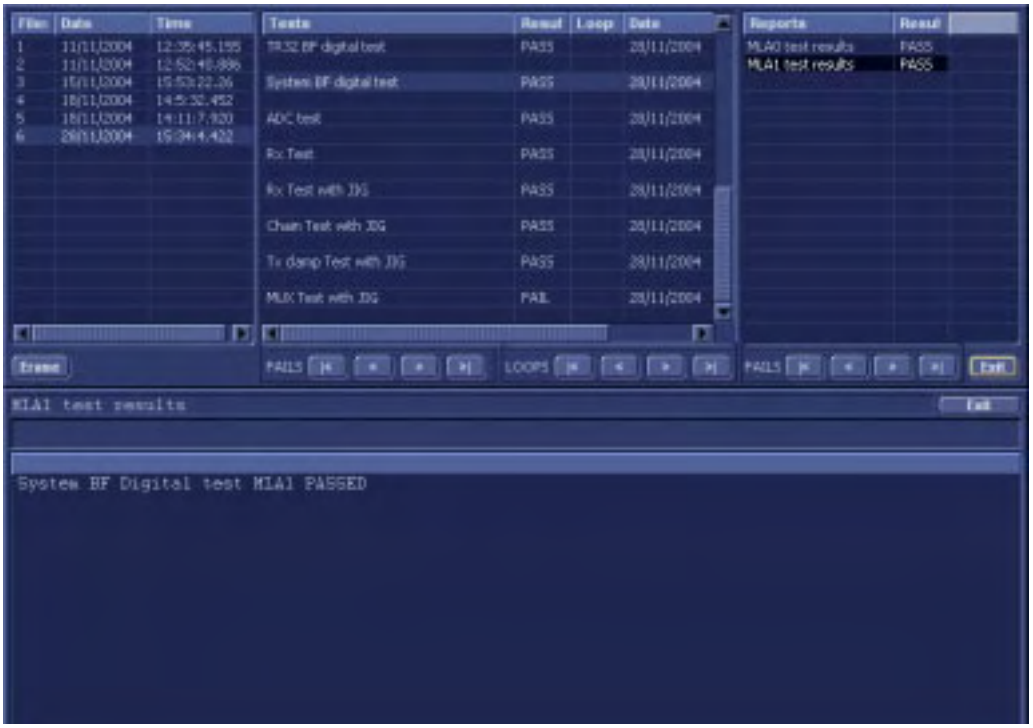


Figure 7-25 View Test Log - System BF Digital Test (MLA1)

10) When done, trackball to the **Exit** button and press **Set** to close the View Report window.

11) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified but the results were marginal, perform calibration, as described in DC Offset Calibration on page 7 - 24, and then repeat the test.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory)*.

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of that board is faulty. Contact your local GE medical systems field engineer for assistance.

12.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

13.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-4-4-2-3 ADC Test

NOTE: For a description of this test, refer to the information in ADC Test on page 7 - 11.

NOTICE **IMPORTANT** In order to access an individual board test, it is necessary to insert the service dongle from system boot-up and enter the Service Password.

NOTE: When performing this test, no probe should be connected to the system and nothing should be touching the probe connectors!

1.) In the *Diagnostic Test* window, trackball to **ADC Test** in the list of *TR32, BF* tests available for selection from the Diagnostic Test Tree (see Figure 7-8 below) and press **Set**. The ADC Test name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (TR32A. TR32B), as shown below:

Figure 7-26 ADC Test

2.) As indicated in the *Special Instructions* area, disconnect any probes currently connected to the system and make sure that nothing is touching the probe connectors.

3.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.

4.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

5.) Trackball to the **Start** button and press **Set**.

The ADC Test commences. While the test proceeds, the name of the test currently in progress (ADC Test) is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

6.) At any stage, trackball to the **Pause** button and press **Set**, if required.

7.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the ADC Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests passed or failed, as shown in the example in Figure 7-27.

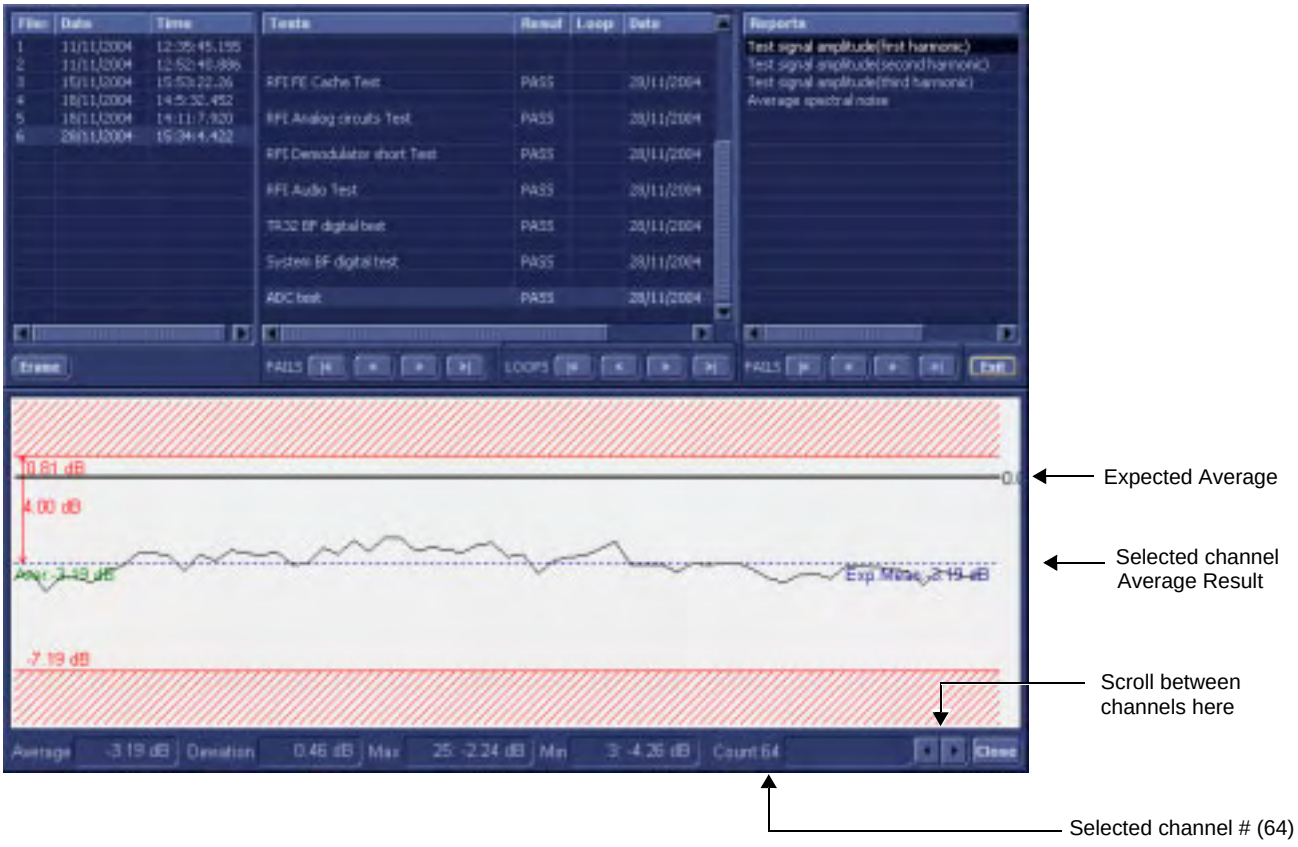


Figure 7-27 View Test Log - First Harmonic Report

Note: The ADC test has four test reports which are listed in *Reports* on the right. By default, the *First Harmonic* report is displayed in the Reports window below (Figure 7-27).

NOTE: Left and right arrows provided in the View Report window enable scrolling between the different channels. Left-clicking on a currently-selected channel marks a red square on the report graph, and also evokes the display of the following information relative to that specific point: Average, Deviation (standard deviation from the Average), Max, and Min.
The signal should be within the limits marked in the white area (the dotted line represents the Average), as shown in Figure 7-27.

8) When done, trackball to the **Close** button and press **Set** to close the View Report window.

9.) Select the second report (the report is highlighted in the *Reports* list, and the corresponding results are shown in the Report window below, as shown in Figure 7-28).

Figure 7-28 View Test Log - Second Harmonic

10.) Use the tools provided to scroll through the channels and view the results, as previously described.

11) When done, trackball to the **Close** button and press **Set** to close the View Report window.

12.) Select the third report (the report is highlighted in the *Reports* list, and the corresponding results are shown in the Report window below, as shown in Figure 7-29).

Figure 7-29 View Test Log - Third Harmonic

13.) Use the tools provided to scroll through the channels and view the results, as previously described.

14) When done, trackball to the **Close** button and press **Set** to close the View Report window.

15.) Select the fourth report (the report is highlighted in the *Reports* list, and the corresponding results are shown in the Report window below, as shown in Figure 7-30).

Figure 7-30 View Test Log - Average

16.) Use the tools provided to scroll through the channels and view the results, as previously described.

17) When done, trackball to the **Close** button and press **Set** to close the View Report window.

18) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified but the results were marginal, perform calibration, as described in DC Offset Calibration on page 7 - 24, and then repeat the test.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory)*.

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of that board is faulty. Contact your local GE medical systems field engineer for assistance.

19.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

20.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-4-4-3 Receive (RX) Tests

7-4-4-3-1 RX Test

NOTE: For a description of this test, refer to the information in RX Test on page 7 - 11.

NOTICE **IMPORTANT** In order to access an individual board test, it is necessary to insert the service dongle from system boot-up and enter the Service Password.

NOTE: When performing this test, no probe should be connected to the system and nothing should be touching the probe connectors!

1.) In the *Diagnostic Test* window, trackball to **Rx Test** in the list of *RX* tests available for selection from the Diagnostic Test Tree (see Figure 7-31 below) and press **Set**. The RX Test name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (TR32A. TR32B), as shown below:

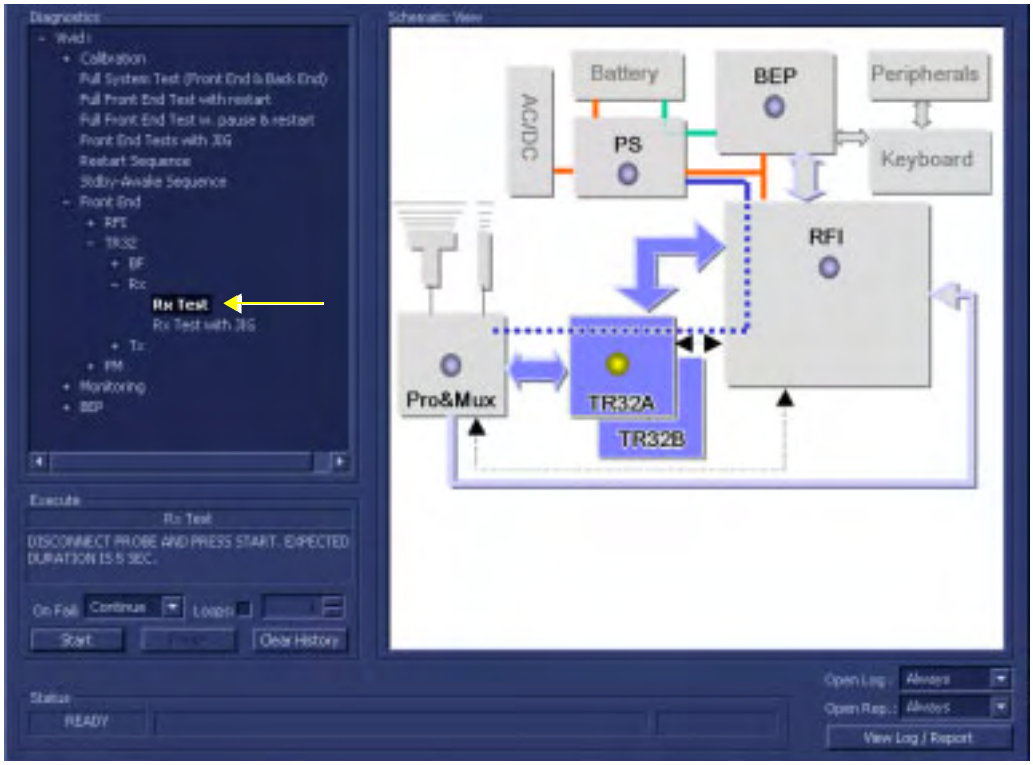


Figure 7-31 Rx Test

2.) As indicated in the *Special Instructions* area, disconnect any probes currently connected to the system and make sure that nothing is touching the probe connectors.

3.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.

4.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

5.) Trackball to the **Start** button and press **Set**.

The Rx Test commences. While the test proceeds, the name of the test currently in progress (Rx Test) is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

6.) At any stage, trackball to the **Pause** button and press **Set**, if required.

7.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the Rx Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests passed or failed, as shown in the example in Figure 7-32.

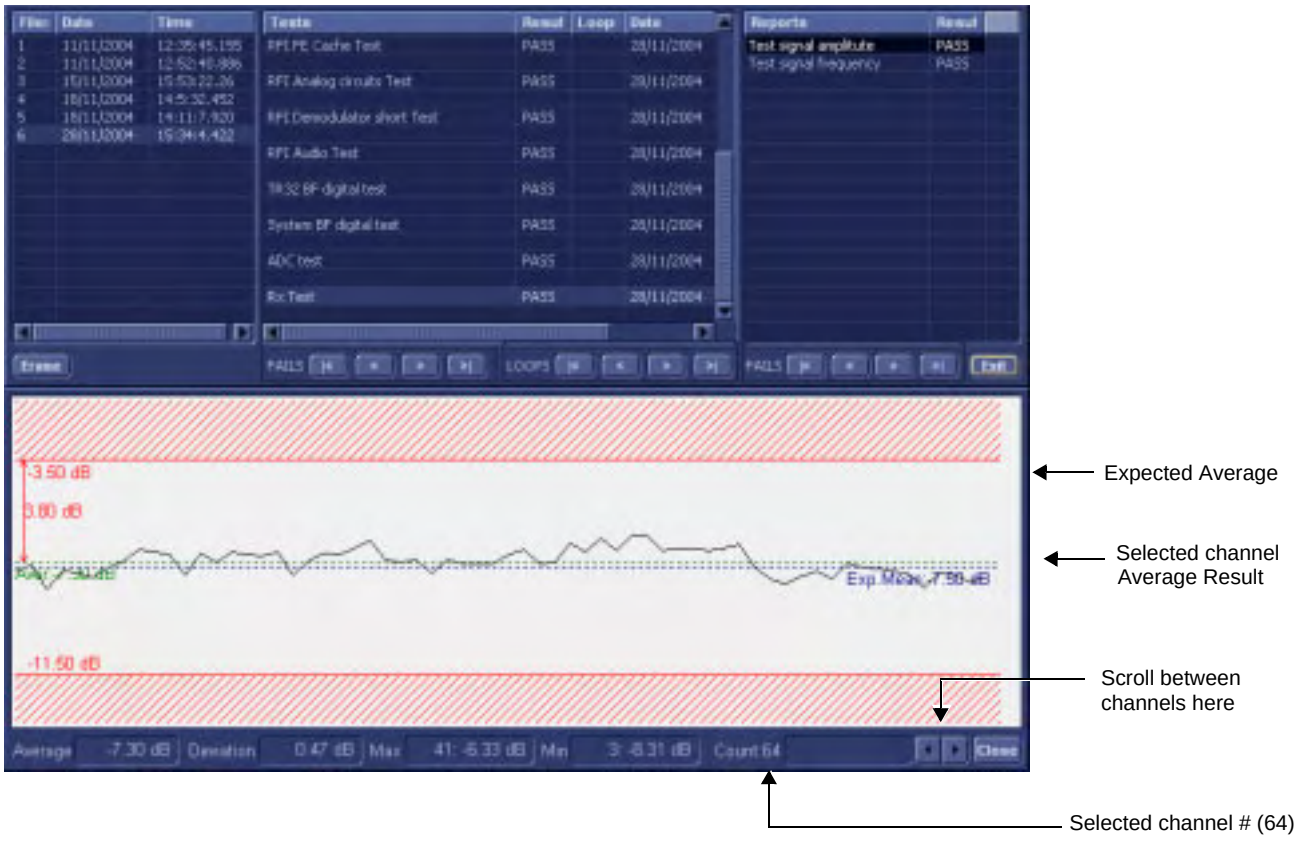


Figure 7-32 View Test Log - Rx Test Signal Amplitude

Note: The Rx test has two test reports (*Test Signal Amplitude* and *Frequency*) which are listed in the *Reports* window on the right. By default, the *Test Signal Amplitude* report is displayed in the Reports window below (Figure 7-32).

NOTE: Left and right arrows provided in the View Report window enable scrolling between the different channels.
Left-clicking on a currently-selected channel marks a red square on the report graph, and also evokes the display of the following information relative to that specific point: Average, Deviation (standard deviation from the Average), Max, and Min.
The signal should be within the limits marked in the white area (the dotted line represents the Average), as shown in Figure 7-32.

8) When done, trackball to the **Close** button and press **Set** to close the View Report window.

9) Select the second report (*Frequency*); the report is highlighted in the *Reports* list, and the corresponding results are shown in the Report window below, as shown in Figure 7-28.

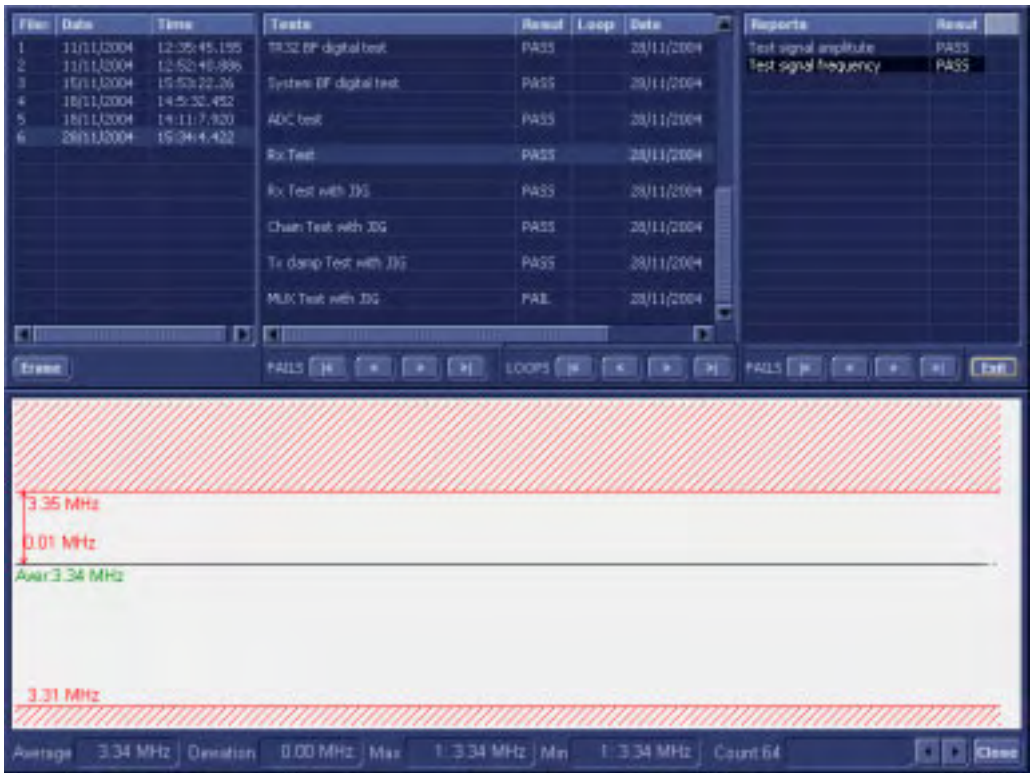


Figure 7-33 View Test Log - Rx Test Signal Frequency

10.) Use the tools provided to scroll through the channels and view the results, as previously described.

11) When done, trackball to the **Close** button and press **Set** to close the View Report window.

12) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified but the results were marginal, perform calibration, as described in DC Offset Calibration on page 7 - 24, and then repeat the test.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory).*

If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of that board is faulty. Contact your local GE medical systems field engineer for assistance.

13.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

14.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-4-5 Probe and MUX Diagnostic Tests

7-4-5-1 Accessing the Probe and MUX Diagnostic Test Options

- Access the *Diagnostic Test* window, as described in the *Accessing the Front End Diagnostic Options* section, on page 7-24.

7-4-5-2 ACW Test

7-4-5-2-1 ACW IQ Symmetry Test

NOTE: For a description of this test, refer to the information in ACW IQ Symmetry Test on page 7 - 11.

NOTICE **IMPORTANT** In order to access an individual board test, it is necessary to insert the service dongle from system boot-up and enter the Service Password.

NOTE: When performing this test, no probe should be connected to the system and nothing should be touching the probe connectors!

IMPORTANT It is necessary to *disable* the Loop option where it should not be used.
After performing this test, you must re-boot the system and perform the DC Offset Calibration procedure as described in DC Offset Calibration on page 7 - 24.

1.) In the *Diagnostic Test* window, trackball to **ACW IQ Symmetry Test** in the list of *ACW* tests available for selection from the Diagnostic Test Tree (see Figure 7-31 below) and press **Set**. The ACW IQ Symmetry Test name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (P&M), as shown below:

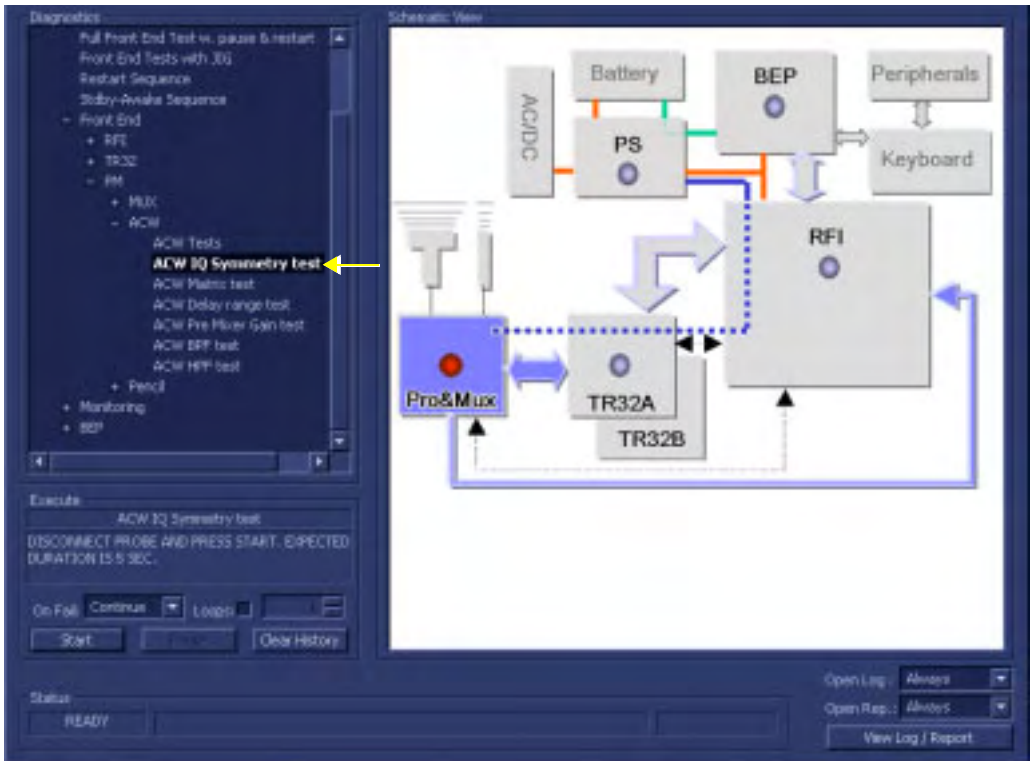


Figure 7-34 ACW IQ Symmetry Test

2.) As indicated in the *Special Instructions* area, disconnect any probes currently connected to the system and make sure that nothing is touching the probe connectors.

3.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you

to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

4.) Trackball to the **Start** button and press **Set**.

The ACW IQ Symmetry Test commences. While the test proceeds, the name of the test currently in progress (ACW IQ Symmetry Test) is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

5.) At any stage, trackball to the **Pause** button and press **Set**, if required.

6.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the ACW IQ Symmetry Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests passed or failed, as shown in the example in Figure 7-35.

Figure 7-35 View Test Log - ACW IQ Symmetry Test

Note: The ACW IQ Symmetry Test test has one test report. By default, this is displayed in the Reports window below (Figure 7-35).

7) When done, trackball to the **Exit** button and press **Set** to close the View Report window.

8) After reviewing the test results, proceed as follows:

- Re-boot the system (this is obligatory).
- Perform calibration, as described in DC Offset Calibration on page 7 - 24.
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory)*.

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of that board is faulty. Contact your local GE medical systems field engineer for assistance.

9.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

10.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-4-5-2-2 ACW Matrix Test

NOTE: For a description of this test, refer to the information in ACW Matrix Test on page 7 - 12.

NOTICE **IMPORTANT** In order to access an individual board test, it is necessary to insert the service dongle from system boot-up and enter the Service Password.

NOTE: When performing this test, no probe should be connected to the system and nothing should be touching the probe connectors!

IMPORTANT It is necessary to *disable* the Loop option where it should not be used.
After performing this test, you must re-boot the system and perform the DC Offset Calibration procedure as described in DC Offset Calibration on page 7 - 24.

1.) In the *Diagnostic Test* window, trackball to **ACW Matrix Test** in the list of *ACW* tests available for selection from the Diagnostic Test Tree (see Figure 7-36 below) and press **Set**. The ACW Matrix Test name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (P&M), as shown below:

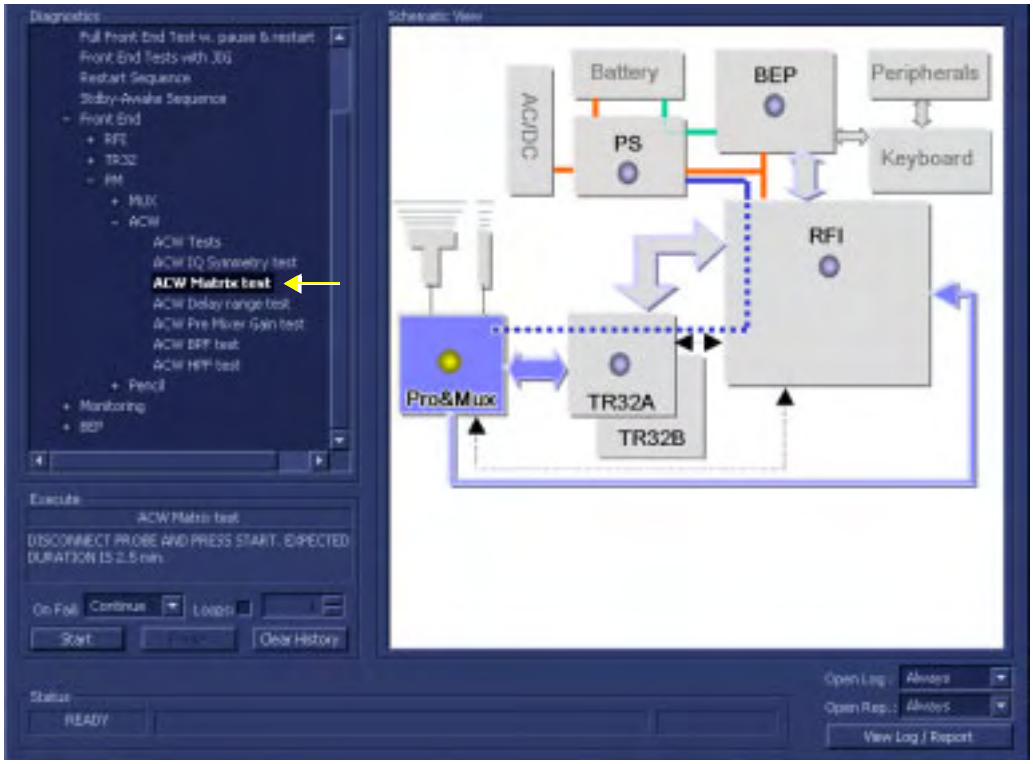


Figure 7-36 ACW Matrix Test

2.) As indicated in the *Special Instructions* area, disconnect any probes currently connected to the system and make sure that nothing is touching the probe connectors.

3.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

4.) Trackball to the **Start** button and press **Set**.

The ACW Matrix Test commences. While the test proceeds, the name of the test currently in progress (ACW IQ Symmetry Test) is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

5.) At any stage, trackball to the **Pause** button and press **Set**, if required.

6.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the ACW Matrix Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests passed or failed, as shown in the example in Figure 7-37.

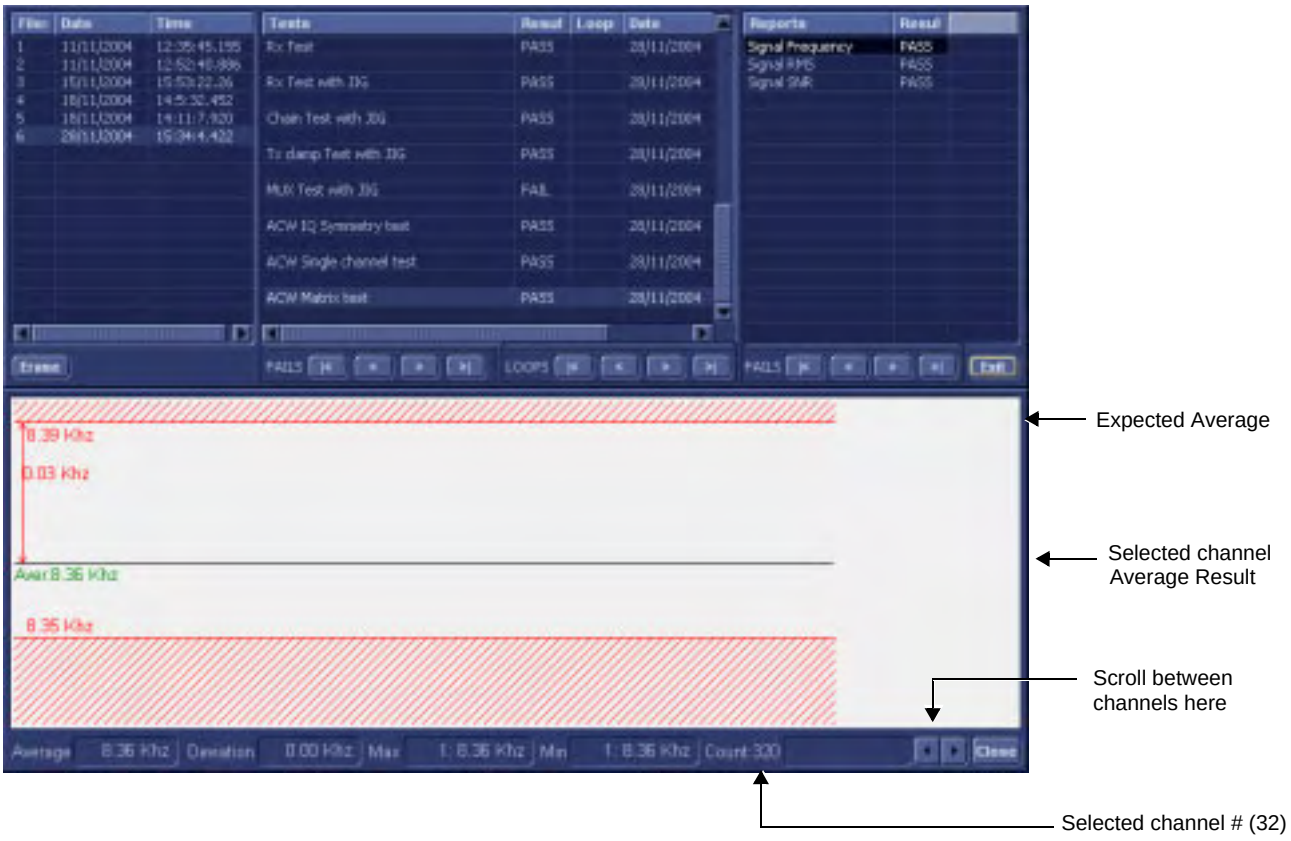


Figure 7-37 View Test Log - ACW Matrix Test - Signal Frequency

Note: The ACW Matrix Test test has three test reports (*Signal Frequency, Signal RMS,* and *Signal SNR*) which are listed in the *Reports* window on the right. By default, the *Signal Frequency* report is displayed in the Reports window below (Figure 7-37).

NOTE: Left and right arrows provided in the View Report window enable scrolling between the different channels.
Left-clicking on a currently-selected channel marks a red square on the report graph, and also evokes the display of the following information relative to that specific point: Average, Deviation (standard deviation from the Average), Max, and Min.
The signal should be within the limits marked in the white area (the dotted line represents the Average), as shown in Figure 7-37.

7) When done, trackball to the **Close** button and press **Set** to close the View Report window.

8) Select the second report (*Signal RMS*); the report is highlighted in the *Reports* list, and the corresponding results are shown in the Report window below, as shown in Figure 7-38.

Figure 7-38 View Test Log - ACW Matrix Test - Signal RMS

9.) Use the tools provided to scroll through the channels and view the results, as previously described.

10) When done, trackball to the **Close** button and press **Set** to close the View Report window.

11) Select the third report (*Signal SNR*); the report is highlighted in the *Reports* list, and the corresponding results are shown in the Report window below, as shown in Figure 7-39.

Figure 7-39 View Test Log - ACW Matrix Test - Signal SNR

12.) Use the tools provided to scroll through the channels and view the results, as previously described.

13) When done, trackball to the **Close** button and press **Set** to close the View Report window.

14) After reviewing the test results, proceed as follows:

- Re-boot the system (this is obligatory).
- Perform calibration, as described in DC Offset Calibration on page 7 - 24
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory).*

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of that board is faulty. Contact your local GE medical systems field engineer for assistance.

15.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

16.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-4-5-2-3 ACW Delay Range Test

NOTE: For a description of this test, refer to the information in ACW Delay Range Test on page 7 - 12.

NOTICE **IMPORTANT** In order to access an individual board test, it is necessary to insert the service dongle from system boot-up and enter the Service Password.

NOTE: When performing this test, no probe should be connected to the system and nothing should be touching the probe connectors!

IMPORTANT It is necessary to *disable* the Loop option where it should not be used.
After performing this test, you must re-boot the system and perform the DC Offset Calibration procedure as described in DC Offset Calibration on page 7 - 24.

1.) In the *Diagnostic Test* window, trackball to **ACW Delay Range Test** in the list of *ACW* tests available for selection from the Diagnostic Test Tree (see Figure 7-40 below) and press **Set**. The ACW Delay Range Test name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (P&M), as shown below:

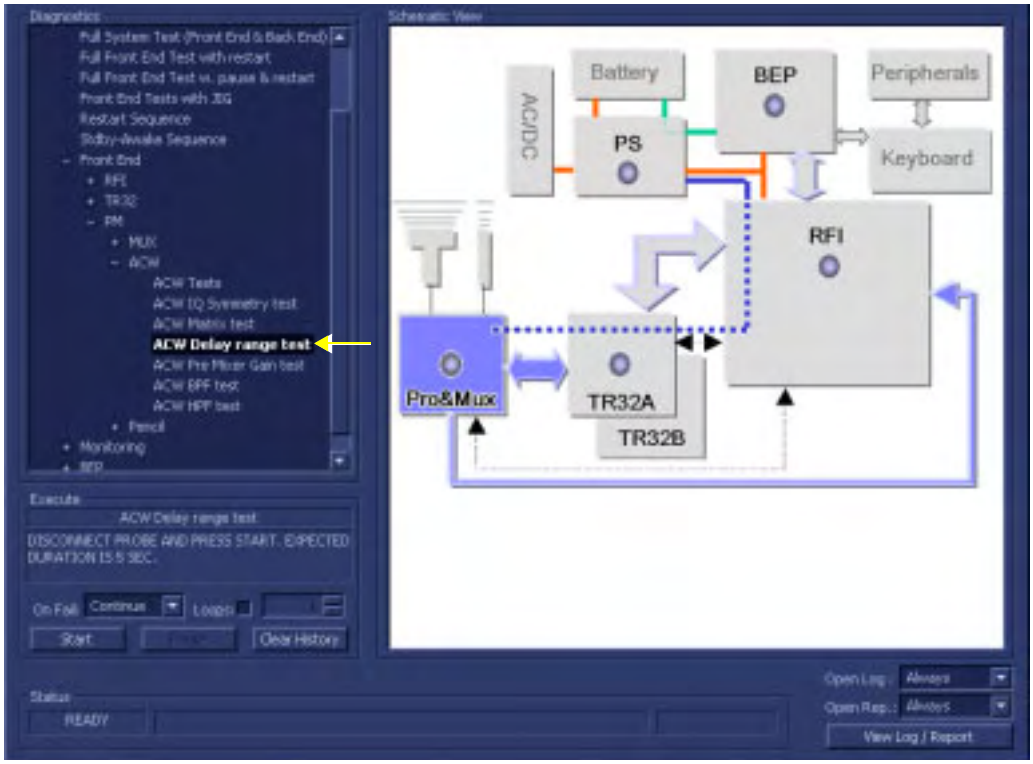


Figure 7-40 ACW Delay Range Test

2.) As indicated in the *Special Instructions* area, disconnect any probes currently connected to the system and make sure that nothing is touching the probe connectors.

3.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

4.) Trackball to the **Start** button and press **Set**.

The ACW Delay Range Test commences. While the test proceeds, the name of the test currently in progress (ACW IQ Delay Range Test) is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

5.) At any stage, trackball to the **Pause** button and press **Set**, if required.

6.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the ACW Delay Range Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests passed or failed, as shown in the example in Figure 7-41.

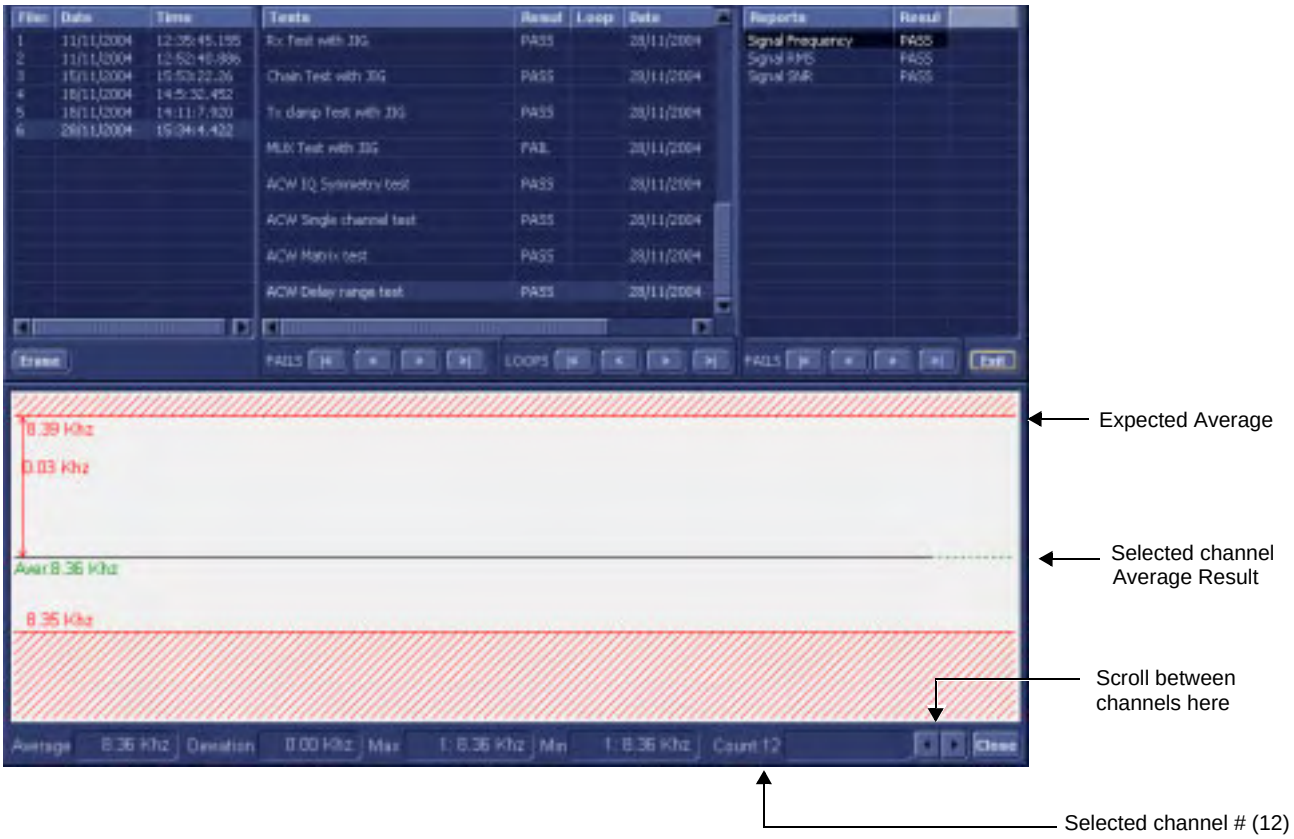


Figure 7-41 View Test Log - ACW Delay Range Test - Signal Frequency

Note: The ACW Delay Range Test test has three test reports (*Signal Frequency, Signal RMS,* and *Signal SNR*) which are listed in the *Reports* window on the right. By default, the *Signal Frequency* report is displayed in the Reports window below (Figure 7-41).

NOTE: Left and right arrows provided in the View Report window enable scrolling between the different channels.
Left-clicking on a currently-selected channel marks a red square on the report graph, and also evokes the display of the following information relative to that specific point: Average, Deviation (standard deviation from the Average), Max, and Min.
The signal should be within the limits marked in the white area (the dotted line represents the Average), as shown in Figure 7-41.

7) When done, trackball to the **Close** button and press **Set** to close the View Report window.

8) Select the second report (*Signal RMS*); the report is highlighted in the *Reports* list, and the corresponding results are shown in the Report window below, as shown in Figure 7-42.

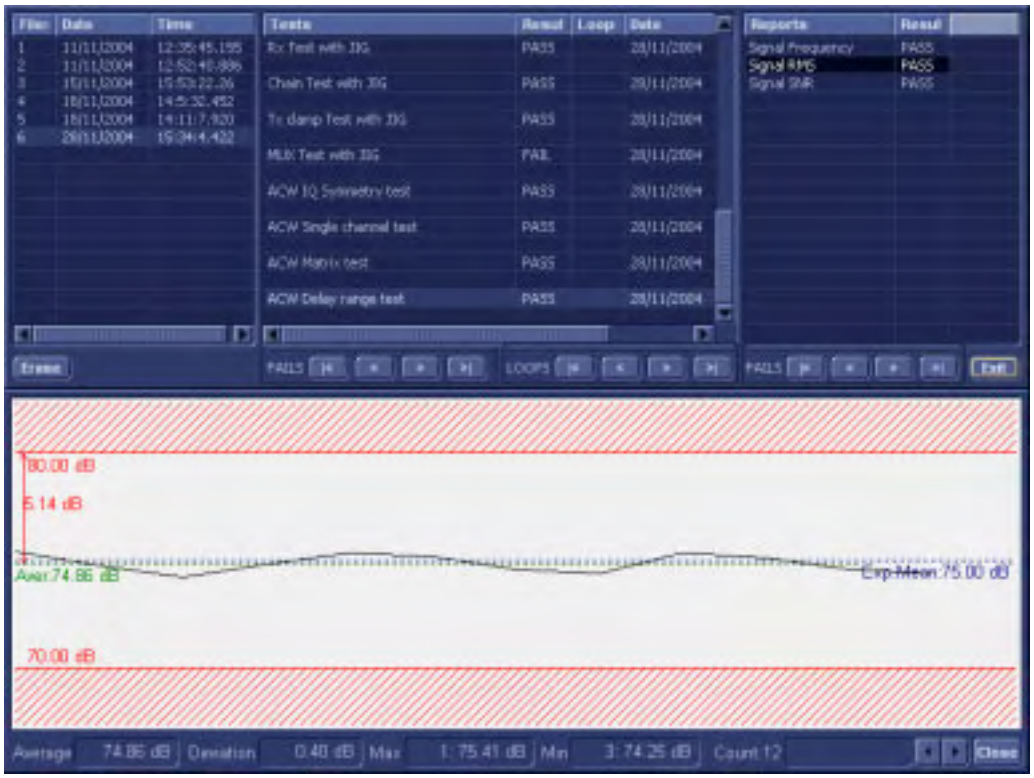


Figure 7-42 View Test Log - ACW Delay Range Test - Signal RMS

9.) Use the tools provided to scroll through the channels and view the results, as previously described.

10) When done, trackball to the **Close** button and press **Set** to close the View Report window.

11) Select the third report (*Signal SNR*); the report is highlighted in the *Reports* list, and the corresponding results are shown in the Report window below, as shown in Figure 7-43.

Figure 7-43 View Test Log - ACW Delay Range Test - Signal SNR

12.) Use the tools provided to scroll through the channels and view the results, as previously described.

13) When done, trackball to the **Close** button and press **Set** to close the View Report window.

14) After reviewing the test results, proceed as follows:

- Re-boot the system (this is obligatory).
- Perform calibration, as described in DC Offset Calibration on page 7 - 24.
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory).*

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of that board is faulty. Contact your local GE medical systems field engineer for assistance.

15.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

16.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-4-5-2-4 ACW Pre-Mixer Gain Test

NOTE: This test will be available for future versions of the Vivid-i™ system. For a description of this test, refer to the information in ACW Pre-Mixer Gain Test on page 7 - 12.

NOTICE **IMPORTANT** In order to access an individual board test, it is necessary to insert the service dongle from system boot-up and enter the Service Password.

NOTE: When performing this test, no probe should be connected to the system and nothing should be touching the probe connectors!

IMPORTANT It is necessary to *disable* the Loop option where it should not be used.
After performing this test, you must re-boot the system and perform the DC Offset Calibration procedure as described in DC Offset Calibration on page 7 - 24.

1.) In the *Diagnostic Test* window, trackball to **ACW Pre-Mixer Gain Test** in the list of *ACW* tests available for selection from the Diagnostic Test Tree (see Figure 7-44 below) and press **Set**. The ACW Pre-Mixer Gain Test name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (P&M), as shown below:

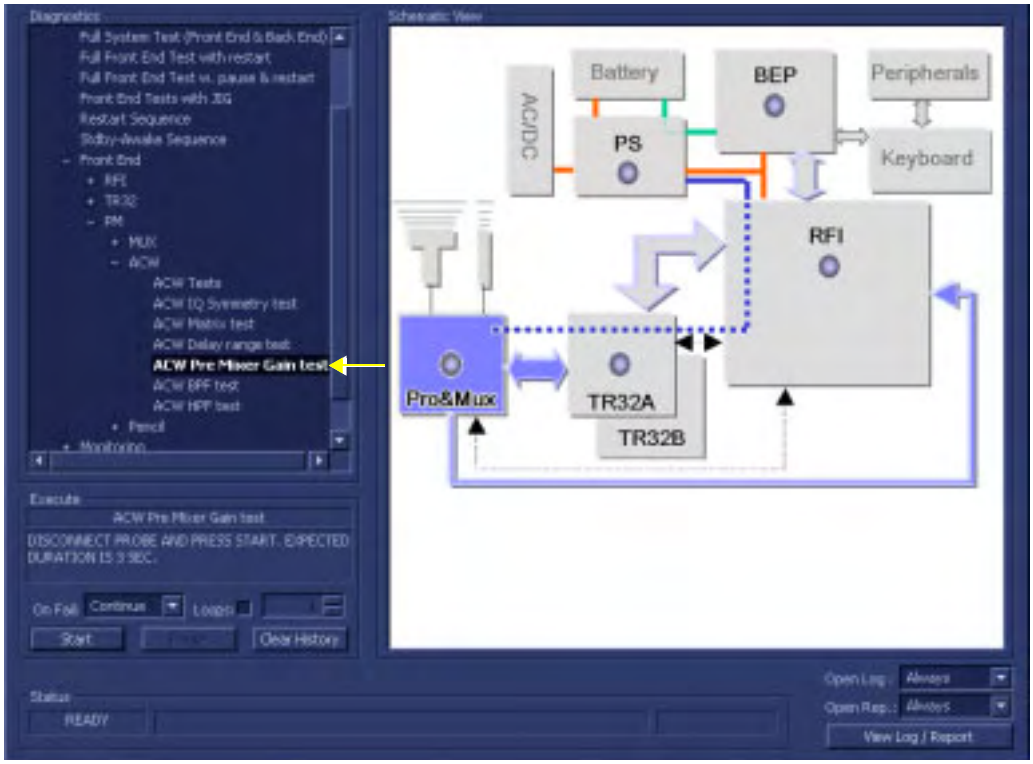


Figure 7-44 ACW Pre-Mixer Gain Test

2.) As indicated in the *Special Instructions* area, disconnect any probes currently connected to the system and make sure that nothing is touching the probe connectors.

3.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

4.) Trackball to the **Start** button and press **Set**.

The ACW Pre-Mixer Gain Test commences. While the test proceeds, the name of the test currently in progress (ACW Pre-Mixer Gain Test) is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

5.) At any stage, trackball to the **Pause** button and press **Set**, if required.

6.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the ACW Pre-Mixer Gain Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests passed or failed, as shown in the example in Figure 7-45.

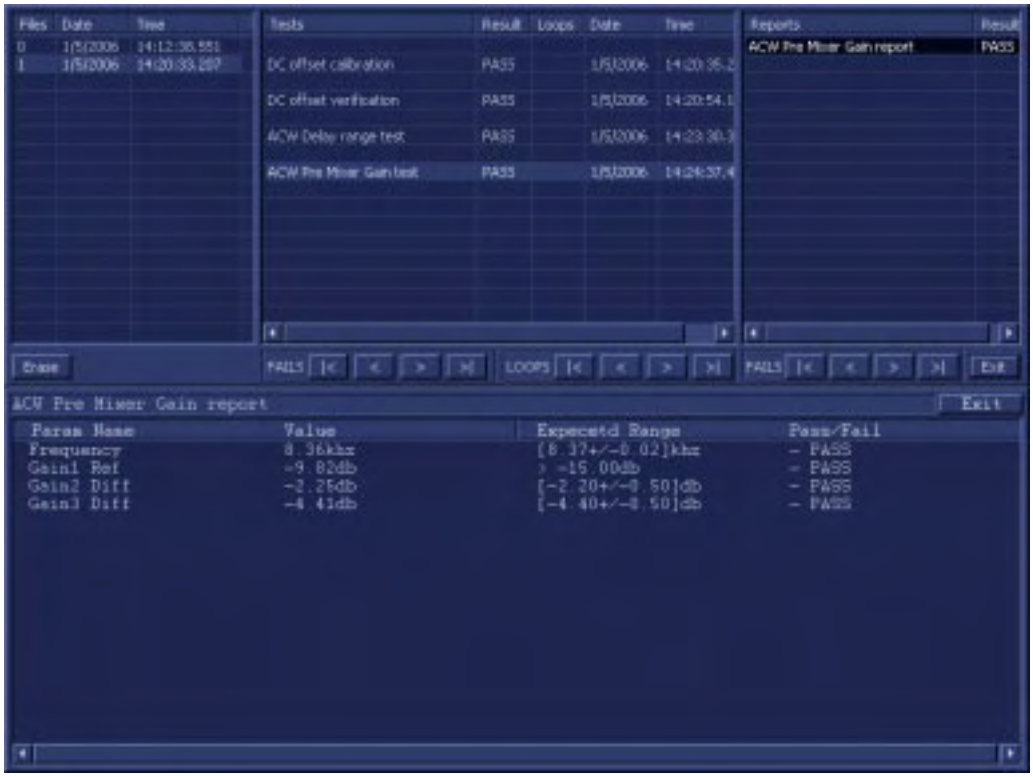


Figure 7-45 View Test Log - ACW Pre-Mixer Gain Test

Note: The ACW Pre-Mixer Gain Test has one test report. By default, this is displayed in the Reports window below (Figure 7-45).

7) When done, trackball to the **Exit** button and press **Set** to close the View Report window.

8) After reviewing the test results, proceed as follows:

- Re-boot the system (this is obligatory).
- Perform calibration, as described in DC Offset Calibration on page 7 - 24.
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory)*.

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of that board is faulty. Contact your local GE medical systems field engineer for assistance.

9.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

10.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-4-5-2-5 ACW BPF Test

NOTE: This test will be available for future versions of the Vivid-i™ system. For a description of this test, refer to the information in ACW BPF Test on page 7 - 12.

NOTICE **IMPORTANT** In order to access an individual board test, it is necessary to insert the service dongle from system boot-up and enter the Service Password.

NOTE: When performing this test, no probe should be connected to the system and nothing should be touching the probe connectors!

IMPORTANT It is necessary to *disable* the Loop option where it should not be used.
After performing this test, you must re-boot the system and perform the DC Offset Calibration procedure as described in DC Offset Calibration on page 7 - 24.

1.) In the *Diagnostic Test* window, trackball to **ACW BPF Test** in the list of *ACW* tests available for selection from the Diagnostic Test Tree (see Figure 7-46 below) and press **Set**. The ACW BPF Test name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (P&M), as shown below:

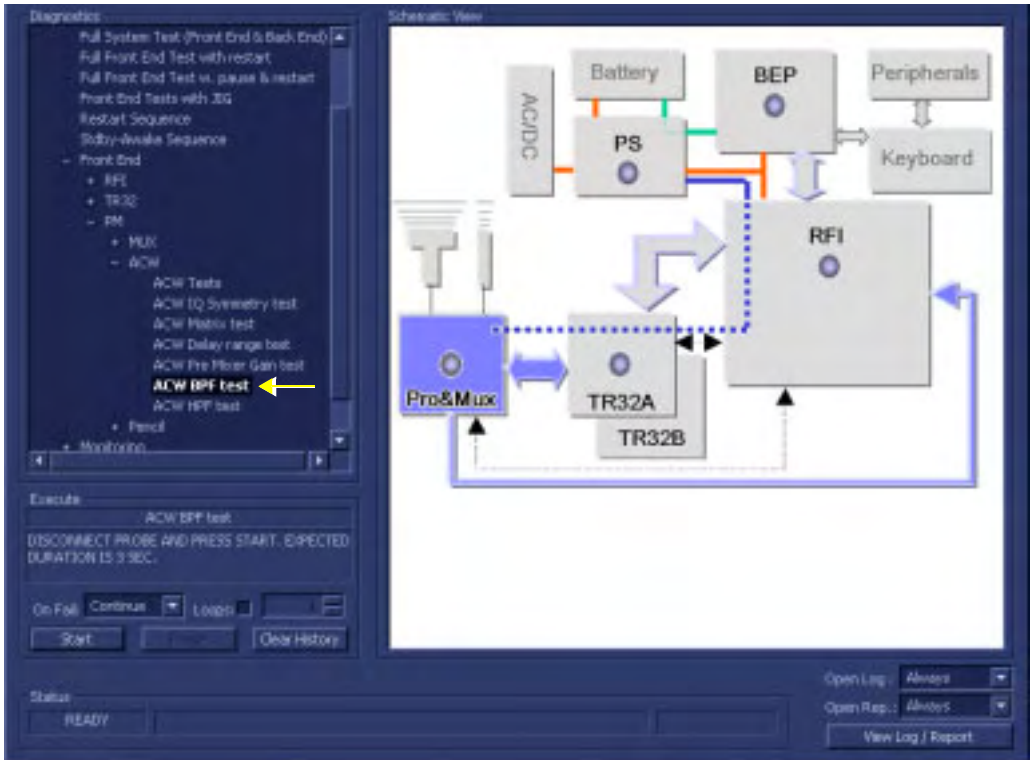


Figure 7-46 ACW BPF Test

2.) As indicated in the *Special Instructions* area, disconnect any probes currently connected to the system and make sure that nothing is touching the probe connectors.

3.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

4.) Trackball to the **Start** button and press **Set**.

The ACW BPF Test commences. While the test proceeds, the name of the test currently in progress (ACW BPF Test) is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

5.) At any stage, trackball to the **Pause** button and press **Set**, if required.

6.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the ACW BPF Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests passed or failed, as shown in the example in Figure 7-47.

Figure 7-47 View Test Log - ACW BPF Test - BPF0

Note: The ACW BPF Test has four test reports (*BPF0*, *BPF1, BPF2,* and *BPF3*) which are listed in the *Reports* window on the right. By default, the *BPF0* report is displayed in the Reports window below (Figure 7-47).

7) When finished reviewing the first report, trackball to the **Exit** button and press **Set** to close the View Report window.

8) Select the second report (*BPF1*); the report is highlighted in the *Reports* list, and the corresponding results are shown in the Report window below, as shown in Figure 7-48.

Figure 7-48 View Test Log - ACW BPF Test - BPF1

9.) Use the tools provided to scroll through the channels and view the results, as previously described.

10) When done, trackball to the **Close** button and press **Set** to close the View Report window.

11) Select the third report (*BPF2*); the report is highlighted in the *Reports* list, and the corresponding results are shown in the Report window below, as shown in Figure 7-49.

Figure 7-49 View Test Log - ACW BPF Test - BPF2

12.) Use the tools provided to scroll through the channels and view the results, as previously described.

13) When done, trackball to the **Close** button and press **Set** to close the View Report window.

14) Select the fourth report (*Signal SNR*); the report is highlighted in the *Reports* list, and the corresponding results are shown in the Report window below, as shown in Figure 7-50.

Figure 7-50 View Test Log - ACW BPF Test - BPF3

15.) Use the tools provided to scroll through the channels and view the results, as previously described.

16) When done, trackball to the **Close** button and press **Set** to close the View Report window.

17) After reviewing the test results, proceed as follows:

- Re-boot the system (this is obligatory).
- Perform calibration, as described in DC Offset Calibration on page 7 - 24.
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory)*.

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of that board is faulty. Contact your local GE medical systems field engineer for assistance.

18.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

19.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-4-5-2-6 ACW HPF Test

NOTE: This test will be available for future versions of the Vivid-i™ system. For a description of this test, refer to the information in ACW HPF Test on page 7 - 12.

NOTICE **IMPORTANT** In order to access an individual board test, it is necessary to insert the service dongle from system boot-up and enter the Service Password.

NOTE: When performing this test, no probe should be connected to the system and nothing should be touching the probe connectors!

IMPORTANT It is necessary to *disable* the Loop option where it should not be used.
After performing this test, you must re-boot the system and perform the DC Offset Calibration procedure as described in DC Offset Calibration on page 7 - 24.

1.) In the *Diagnostic Test* window, trackball to **ACW HPF Test** in the list of *ACW* tests available for selection from the Diagnostic Test Tree (see Figure 7-51 below) and press **Set**. The ACW HPF Test name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (P&M), as shown below:

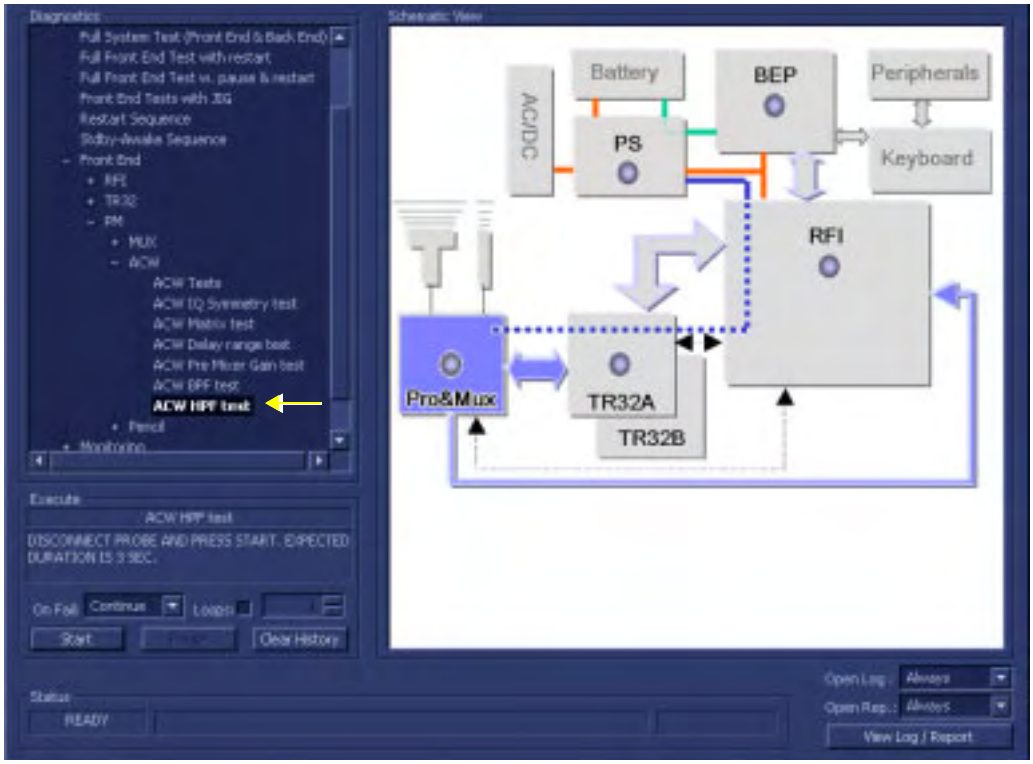


Figure 7-51 ACW HPF Test

2.) As indicated in the *Special Instructions* area, disconnect any probes currently connected to the system and make sure that nothing is touching the probe connectors.

3.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

4.) Trackball to the **Start** button and press **Set**.

The ACW HPF Test commences. While the test proceeds, the name of the test currently in progress (ACW HPF Test) is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

5.) At any stage, trackball to the **Pause** button and press **Set**, if required.

6.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the ACW HPF Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests passed or failed, as shown in the example in Figure 7-52.

Figure 7-52 View Test Log - ACW HPF Test - 300

Note: The ACW HPF Test has two test reports (*HPF300* and *HPF600*) which are listed in the *Reports* window on the right. By default, the *HPF300* report is displayed in the Reports window below (Figure 7-52).

7) When finished reviewing the first report, trackball to the **Exit** button and press **Set** to close the View Report window.

8) Select the second report (*HPF600*); the report is highlighted in the *Reports* list, and the corresponding results are shown in the Report window below, as shown in Figure 7-53.

Figure 7-53 View Test Log - ACW HPF Test - 600

9) When done, trackball to the **Exit** button and press **Set** to close the View Report window.

10) After reviewing the test results, proceed as follows:

- Re-boot the system (this is obligatory).
- Perform calibration, as described in DC Offset Calibration on page 7 - 24.
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory)*.

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of that board is faulty. Contact your local GE medical systems field engineer for assistance.

11.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

12.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-4-5-3 Pencil Test

7-4-5-3-1 Pencil Rx Test

NOTE: This test will be available for future versions of the Vivid-i™ system. For a description of this test, refer to the information in Pencil Rx Test on page 7 - 12.

NOTICE **IMPORTANT** In order to access an individual board test, it is necessary to insert the service dongle from system boot-up and enter the Service Password.

NOTE: When performing this test, no probe should be connected to the system and nothing should be touching the probe connectors!

1.) In the *Diagnostic Test* window, trackball to **Pencil RX Test** in the list of *Pencil* tests available for selection from the Diagnostic Test Tree (see Figure 7-54 below) and press **Set**. The Pencil RX Test name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (P&M), as shown below:

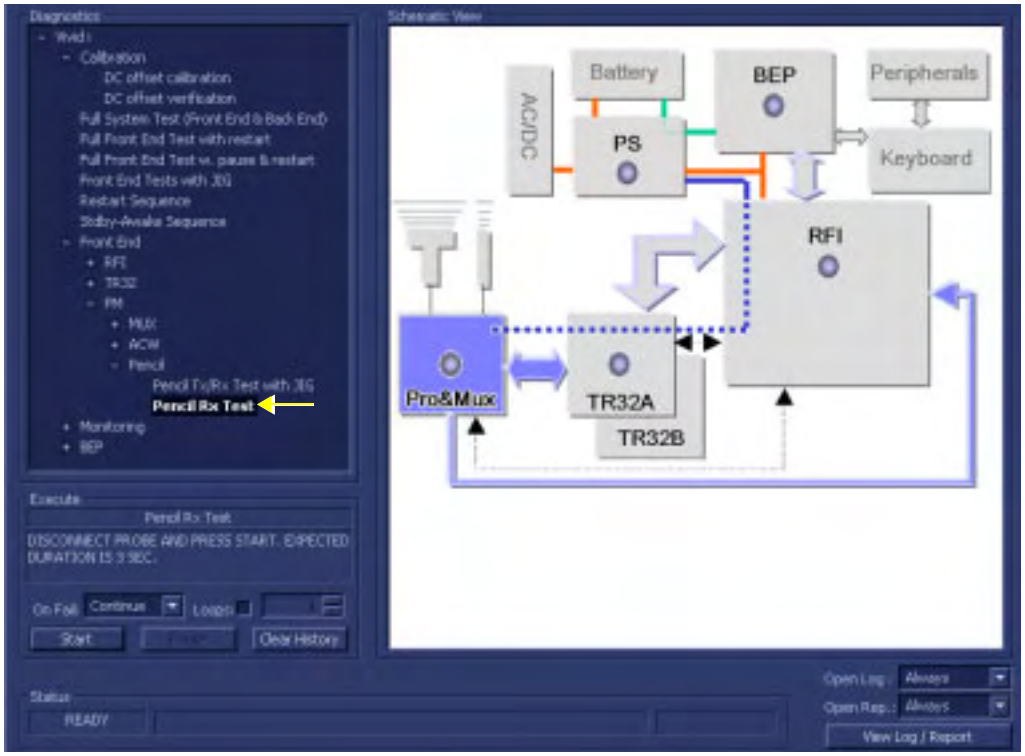


Figure 7-54 Pencil RX Test

2.) As indicated in the *Special Instructions* area, disconnect any probes currently connected to the system and make sure that nothing is touching the probe connectors.

3.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.

4.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

5.) Trackball to the **Start** button and press **Set**.

The Pencil RX Test commences. While the test proceeds, the name of the test currently in progress (Pencil RX Test) is displayed in the *Execute* field and the current *Loop #* and specific test are shown

below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

6.) At any stage, trackball to the **Pause** button and press **Set**, if required.

7.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the Pencil RX Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests passed or failed, as shown in the example in Figure 7-55.

Figure 7-55 View Test Log - Pencil RX Test

Note: The Pencil RX Test has one test report which is listed in *Reports* on the right and displayed in the Reports window below (Figure 7-55).

8) When finished reviewing the first report, trackball to the **Exit** button and press **Set** to close the View Report window.

9) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.

- If errors were identified but the results were marginal, perform calibration, as described in DC Offset Calibration on page 7 - 24, and then repeat the test.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory).*

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of that board is faulty. Contact your local GE medical systems field engineer for assistance.

10.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

11.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

Section 7-5
Monitoring Tests

7-5-1 Accessing the Monitoring Diagnostic Test Options

- Access the *Diagnostic Test* window, as described in the *Accessing the Front End Diagnostic Options* section, on page 7-24.

7-5-1-1 Full System Monitoring Test

NOTE: For a description of this test, refer to the information in Full System Monitoring Test on page 7 - 13.

NOTICE **IMPORTANT** In order to access an individual board test, it is necessary to insert the service dongle from system boot-up and enter the Service Password.

1.) In the *Diagnostic Test* window, trackball to **Full System Monitoring Test** in the list of *Monitoring* tests available for selection from the Diagnostic Test Tree (see Figure 7-56 below) and press **Set**. The Full System Monitoring Test name is displayed under *Execute;* all system components to be tested are highlighted light blue in the Schematic View, as shown below:

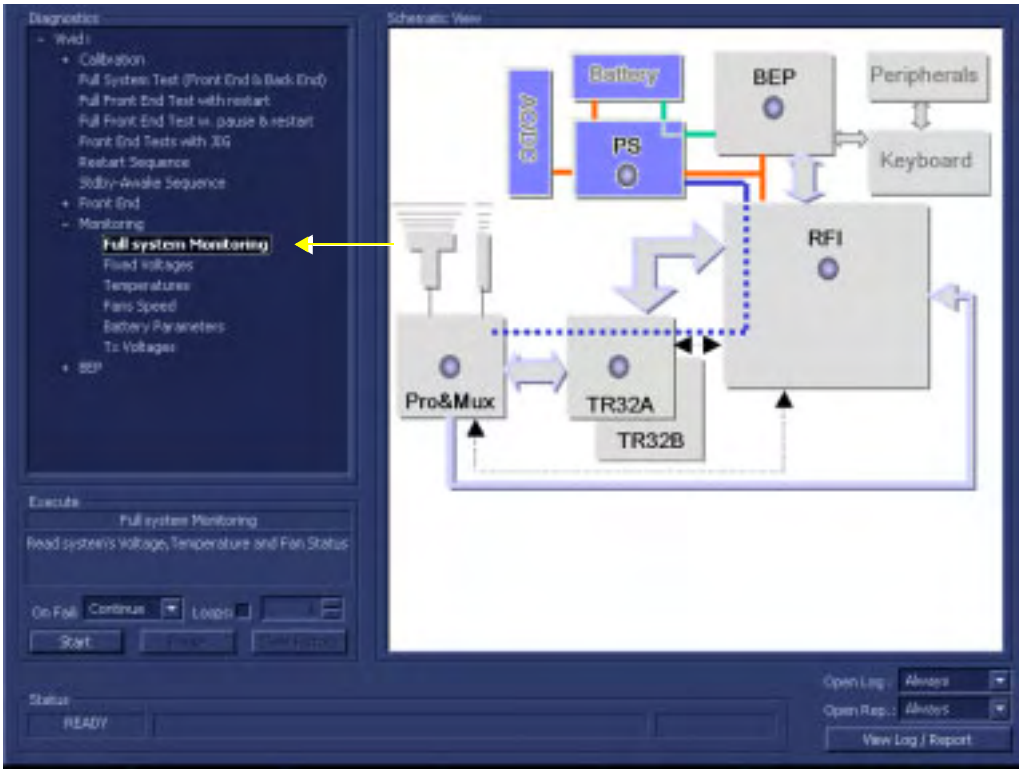


Figure 7-56 Full System Monitoring Test

2.) As indicated in the *Special Instructions* area, disconnect any probes currently connected to the system and make sure that nothing is touching the probe connectors.

3.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.

4.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

5.) Trackball to the **Start** button and press **Set**.

The Full System Monitoring Test commences. While the test proceeds, the name of the test currently in progress (ADC Test) is displayed in the *Execute* field and the current *Loop* # and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

6.) At any stage, trackball to the **Pause** button and press **Set**, if required.

7.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the Full System Monitoring Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests passed or failed, as shown in the example in Figure 7-57.

Figure 7-57 View Test Log - Full System Monitoring Test

Note: The Full System Monitoring Test has five sub-tests (*Fixed Voltages*, *Temperatures, Fans Speed, Battery Parameters, and Tx Voltages*). These are listed in the *Test* column, as shown in Figure 7-57.

8.) Select the first report (Fixed Voltages); the report is highlighted in the *Reports* list, and the corresponding results are shown in the Report window below, as shown in Figure 7-58.

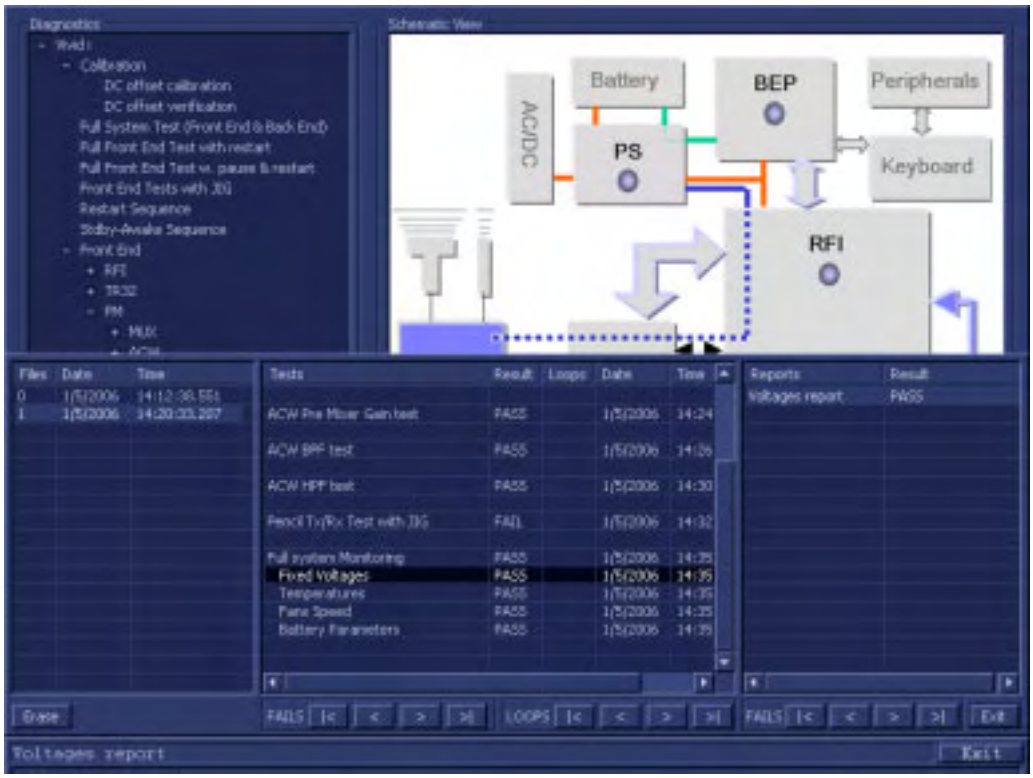


Figure 7-58 View Test Log - Full System Monitoring Test - Fixed Voltages

9.) Check that the sub-test passed and that result values are within the pre-defined *Max* and *Min* limits, as shown in Figure 7-58.

10.) Select the second report (Temperatures); the report is highlighted in the *Reports* list, and the corresponding results are shown in the Report window below, as shown in Figure 7-59.

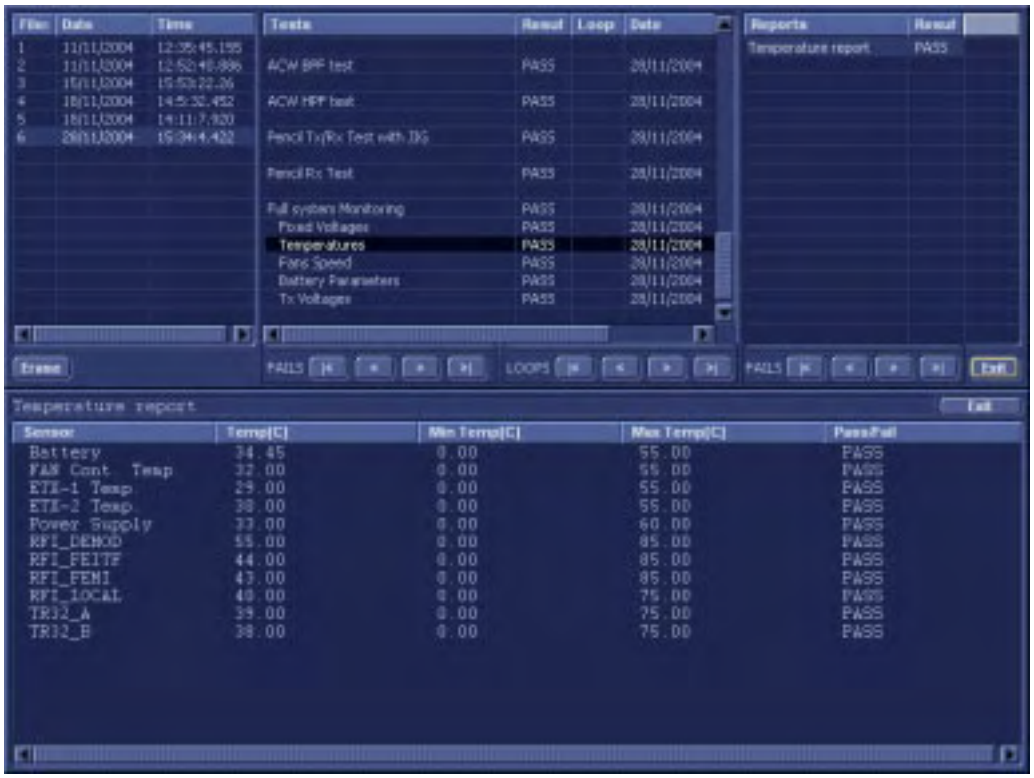

Temperature report
Sensor
Temp[C]
Min Temp[C]
Max Temp[C]
Pass/Fail
Battery 34.45 0.00 55.00 PASS
FAN Cont Temp 32.00 0.00 55.00 PASS
ETX-1 Temp 29.00 0.00 55.00 PASS
ETX-2 Temp 30.00 0.00 55.00 PASS
Power Supply 33.00 0.00 60.00 PASS
RFI_DEMOD 55.00 0.00 85.00 PASS
RFI_FEITF 44.00 0.00 85.00 PASS
RFI_FEMI 43.00 0.00 85.00 PASS
RFI_LOCAL 40.00 0.00 75.00 PASS
TR32_A 39.00 0.00 75.00 PASS
TR32_B 38.00 0.00 75.00 PASS

Figure 7-59 View Test Log - Full System Monitoring Test - Temperatures

11.) Check that the sub-test passed and that result values are within the pre-defined *Max* and *Min* limits, as shown in Figure 7-59.

12.) Select the third report (Fans Speed); the report is highlighted in the *Reports* list, and the corresponding results are shown in the Report window below, as shown in Figure 7-60.

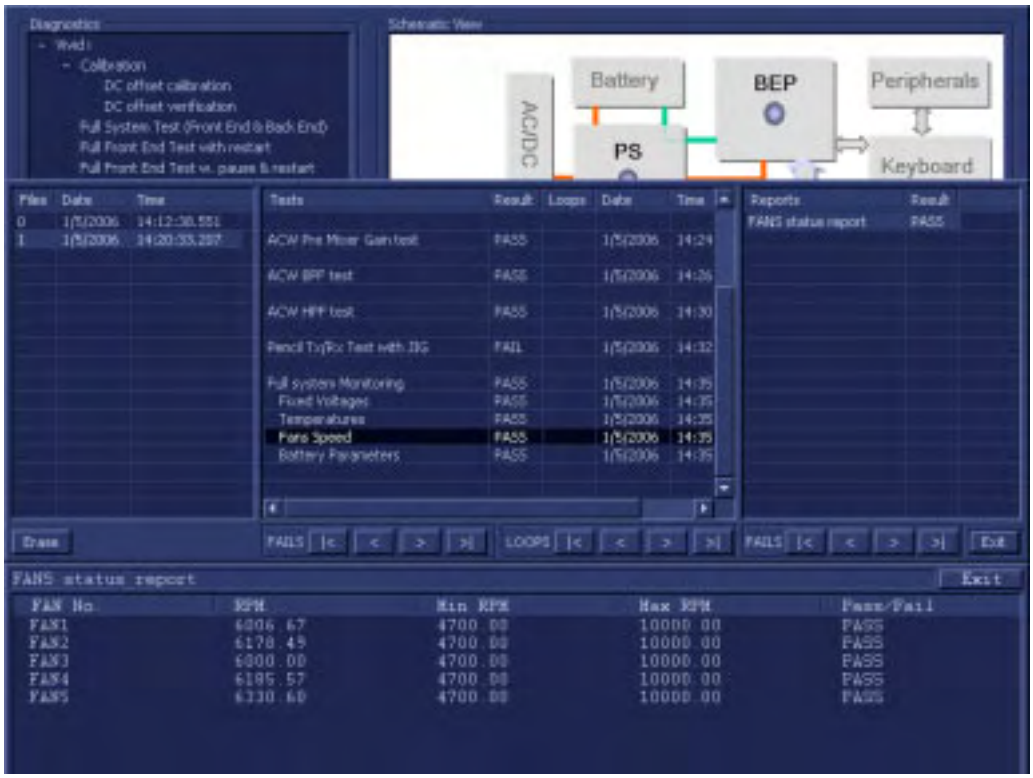


Figure 7-60 View Test Log - Full System Monitoring Test - Fans Speed

13.) Check that the sub-test passed and that result values are within the pre-defined *Max* and *Min* limits, as shown in Figure 7-58.

14.) Select the fourth report (Battery Parameters); the report is highlighted in the *Reports* list, and the corresponding results are shown in the Report window below, as shown in Figure 7-61.

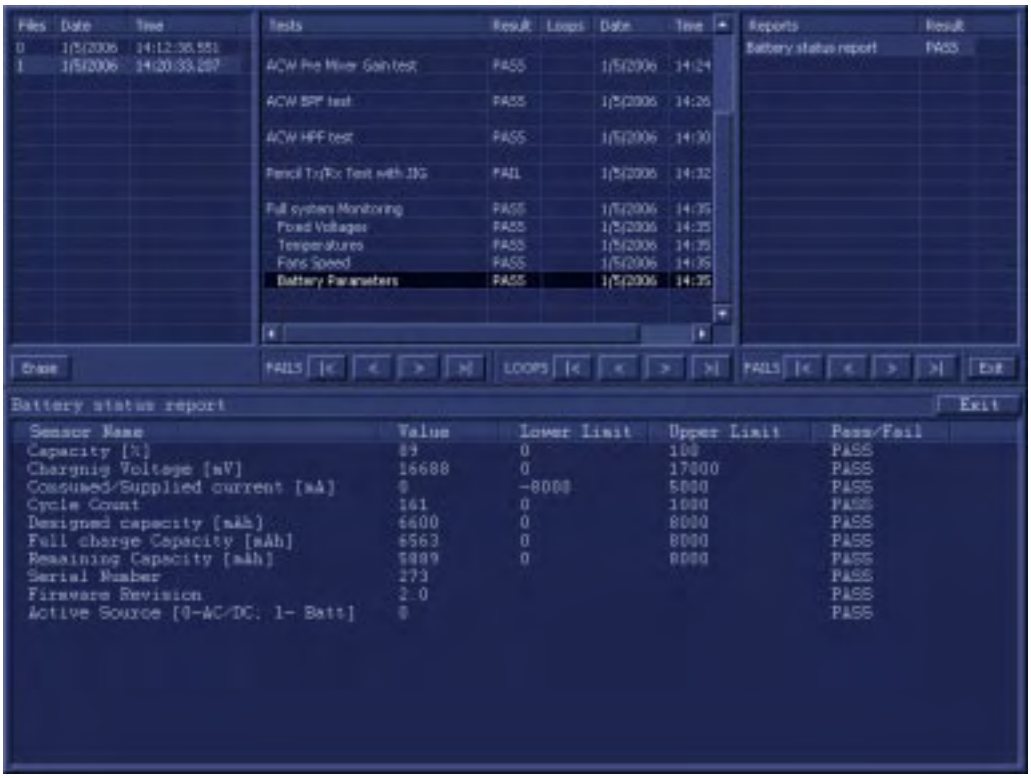

Files Date Time
Tests Result Loops Date Time
Reports Result
Battery status report PASS
ACW Pre Mixer Gain test PASS
ACW BPF test PASS
ACW HPF test PASS
Pencil Tx/Rx Test with JIG FAIL
Full system Monitoring PASS
Fixed Voltages PASS
Temperatures PASS
Fans Speed PASS
Battery Parameters PASS
Erase
FAILS
LOOPS
Exit
Battery status report
Sensor Name Value Lower Limit Upper Limit Pass/Fail
Capacity [%] 89 0 100 PASS
Charging Voltage [mV] 16688 0 17000 PASS
Consumed/Supplied current [mA] 0 -8000 5000 PASS
Cycle Count 161 0 1000 PASS
Designed capacity [mAh] 6600 0 8000 PASS
Full charge Capacity [mAh] 6563 0 8000 PASS
Remaining Capacity [mAh] 5889 0 8000 PASS
Serial Number 273 PASS
Firmware Revision 2.0 PASS
Active Source [0-AC/DC, 1- Batt] 0 PASS

Figure 7-61 View Test Log - Full System Monitoring Test - Battery Parameters

15.) Check that the sub-test passed and that result values are within the pre-defined *Upper* and *Lower* limits, as shown in Figure 7-61.

16.) Select the fifth report (Tx Voltages); the report is highlighted in the *Reports* list, and the corresponding results are shown in the Report window below, as shown in Figure 7-62.

Figure 7-62 View Test Log - Full System Monitoring Test - Tx Voltages

17.) Check that the sub-test passed and that result values are within the pre-defined *Max* and *Min* limits, as shown in Figure 7-62.

18) When done, trackball to the **Exit** button and press **Set** to close the View Report window.

19) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified but the results were marginal, perform calibration, as described in DC Offset Calibration on page 7 - 24, and then repeat the test.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory)*.

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of that board is faulty. Contact your local GE medical systems field engineer for assistance.

20.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

21.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-5-1-2 Fixed Voltages Test

NOTE: For a description of this test, refer to the information in Fixed Voltages Test on page 7 - 13.

NOTICE **IMPORTANT** In order to access an individual board test, it is necessary to insert the service dongle from system boot-up and enter the Service Password.

1.) In the *Diagnostic Test* window, trackball to **Fixed Voltages** in the list of *Monitoring* tests available for selection from the Diagnostic Test Tree (see Figure 7-63 below) and press **Set**. The Fixed Voltages Test name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (AC/DC, Battery, PS), as shown below:

Figure 7-63 Voltages Test

2.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.

3.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

4.) Trackball to the **Start** button and press **Set**.

The Fixed Voltages Test commences. While the test proceeds, the name of the test currently in progress (Fixed Voltages) is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.

- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

5.) At any stage, trackball to the **Pause** button and press **Set**, if required.

6.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the Fixed Voltages Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests passed or failed, as shown in the example in Figure 7-64.

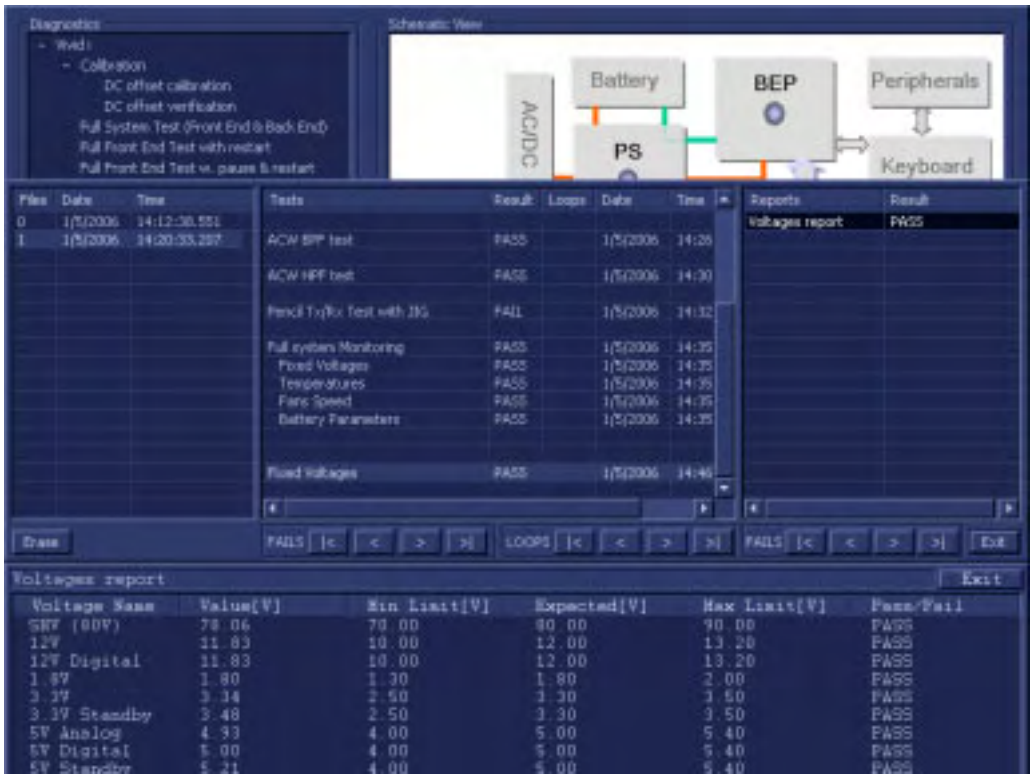


Figure 7-64 View Test Log - Fixed Voltages Test

Note: For this test, there is one report (Voltages) which is listed in the *Reports* window on the right. By default, this report is displayed in the Reports window below.

7.) Check that the test passed and that result values are within the pre-defined *Max* and *Min* limits, as shown in Figure 7-64.

8) When done, trackball to the **Exit** button and press **Set** to close the View Report window.

9) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified but the results were marginal, perform calibration, as described in DC Offset Calibration on page 7 - 24, and then repeat the test.

- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory).*

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of this board is faulty. Contact your local GE medical systems field engineer for assistance.

10.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

11.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-5-1-3 Temperatures Test

NOTE: For a description of this test, refer to the information in Temperatures Test on page 7 - 13.

NOTICE **IMPORTANT** In order to access an individual board test, it is necessary to insert the service dongle from system boot-up and enter the Service Password.

1.) In the *Diagnostic Test* window, trackball to **Temperatures** in the list of *Monitoring* tests available for selection from the Diagnostic Test Tree (see Figure 7-65 below) and press **Set**. The Temperatures Test name is displayed under *Execute;* all system components (excluding the P&M) will be tested are highlighted light blue in the Schematic View (all), as shown below:

Figure 7-65 Temperatures Test

2.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.

3.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

4.) Trackball to the **Start** button and press **Set**.

The Temperatures Test commences. While the test proceeds, the name of the test currently in progress (Temperatures) is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.

- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

5.) At any stage, trackball to the **Pause** button and press **Set**, if required.

6.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the Temperatures Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests passed or failed, as shown in the example in Figure 7-66.

Temperature report
Sensor
Temp[C]
Min Temp[C]
Max Temp[C]
Pass/Fail
Battery 34.45 0.00 55.00 PASS
FAN Cont Temp 31.00 0.00 55.00 PASS
ETX-1 Temp 29.00 0.00 55.00 PASS
ETX-2 Temp 38.00 0.00 55.00 PASS
Power Supply 33.00 0.00 60.00 PASS
RFI_DEMOD 56.00 0.00 85.00 PASS
RFI_FEITF 44.00 0.00 85.00 PASS
RFI_FEMI 43.00 0.00 85.00 PASS
RFI_LOCAL 40.00 0.00 75.00 PASS
TRIG_A 39.00 0.00 75.00 PASS
TRIG_B 38.00 0.00 75.00 PASS

Figure 7-66 View Test Log - Temperatures Test

Note: For this test, there is one report (Temperatures) which is listed in the *Reports* window on the right. By default, this report is displayed in the Reports window below.

7.) Check that the test passed and that result values are within the pre-defined *Max* and *Min* limits, as shown in Figure 7-66.

8) When done, trackball to the **Exit** button and press **Set** to close the View Report window.

9) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified but the results were marginal, perform calibration, as described in DC Offset Calibration on page 7 - 24, and then repeat the test.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory).*

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of this board is faulty. Contact your local GE medical systems field engineer for assistance.

10.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

11.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-5-1-4 Fans Speed Test

NOTE: For a description of this test, refer to the information in Fans Speed Test on page 7 - 13.

NOTICE **IMPORTANT** In order to access an individual board test, it is necessary to insert the service dongle from system boot-up and enter the Service Password.

1.) In the *Diagnostic Test* window, trackball to **Fans Speed** in the list of *Monitoring* tests available for selection from the Diagnostic Test Tree (see Figure 7-67 below) and press **Set**. The Fans Speed Test name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (AC/DC, Battery, PS), as shown below:

Figure 7-67 Fans Speed Test

2.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.

3.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

4.) Trackball to the **Start** button and press **Set**.

The Fans Speed Test commences. While the test proceeds, the name of the test currently in progress (Fans Speed) is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.

- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

5.) At any stage, trackball to the **Pause** button and press **Set**, if required.

6.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the Fans Speed Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests passed or failed, as shown in the example in Figure 7-68.

Figure 7-68 View Test Log - Fans Speed Test

Note: For this test, there is one report (Fans Status) which is listed in the *Reports* window on the right. By default, this report is displayed in the Reports window below.

7.) Check that the test passed and that result values for each fan are within the pre-defined *Max* and *Min* limits, as shown in Figure 7-68.

8) When done, trackball to the **Exit** button and press **Set** to close the View Report window.

9) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified but the results were marginal, perform calibration, as described in DC Offset Calibration on page 7 - 24, and then repeat the test.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory).*

If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of this board is faulty. Contact your local GE medical systems field engineer for assistance.

10.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

11.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-5-1-5 Battery Parameters Test

NOTE: *For a description of this test, refer to the information in Battery Parameters Test on page 7 - 13.*

NOTICE **IMPORTANT** In order to access an individual board test, it is necessary to insert the service dongle from system boot-up and enter the Service Password.

1.) In the *Diagnostic Test* window, trackball to **Battery Parameters** in the list of *Monitoring* tests available for selection from the Diagnostic Test Tree (see Figure 7-69 below) and press **Set**. The Battery Parameters Test name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (AC/DC, Battery, PS), as shown below:

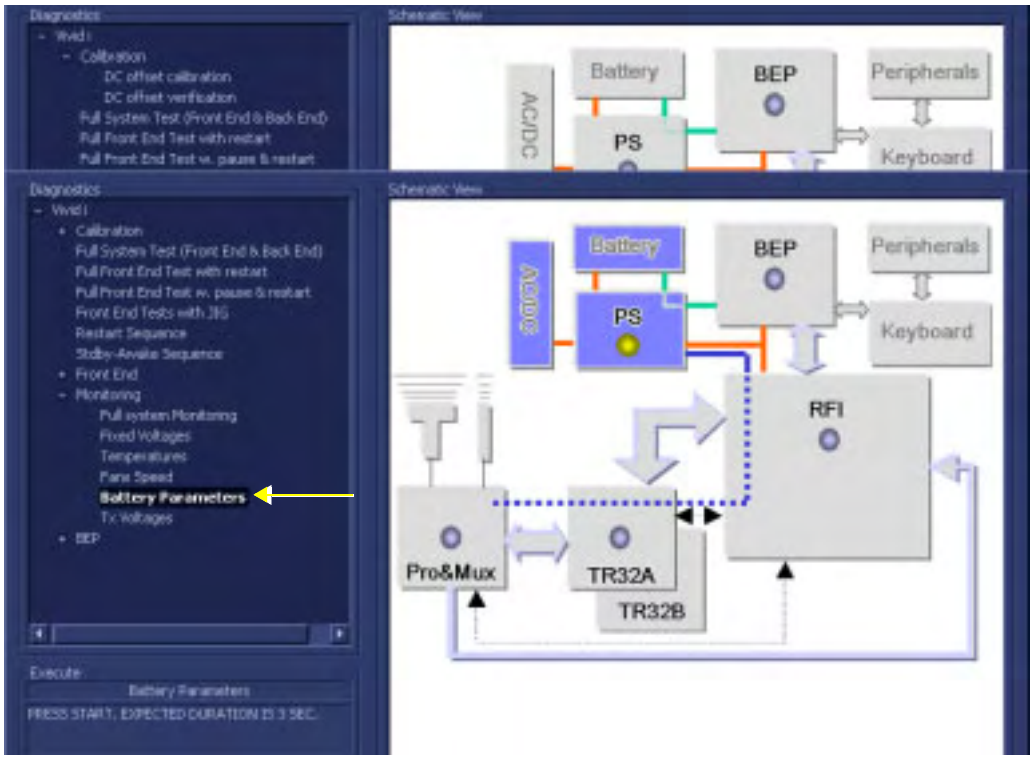


Figure 7-69 Battery Parameters Test

2.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.

3.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

4.) Trackball to the **Start** button and press **Set**.

The Battery Parameters Test commences. While the test proceeds, the name of the test currently in progress (Battery Parameters) is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.

- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

5.) At any stage, trackball to the **Pause** button and press **Set**, if required.

6.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the Battery Parameters Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests passed or failed, as shown in the example in Figure 7-70.

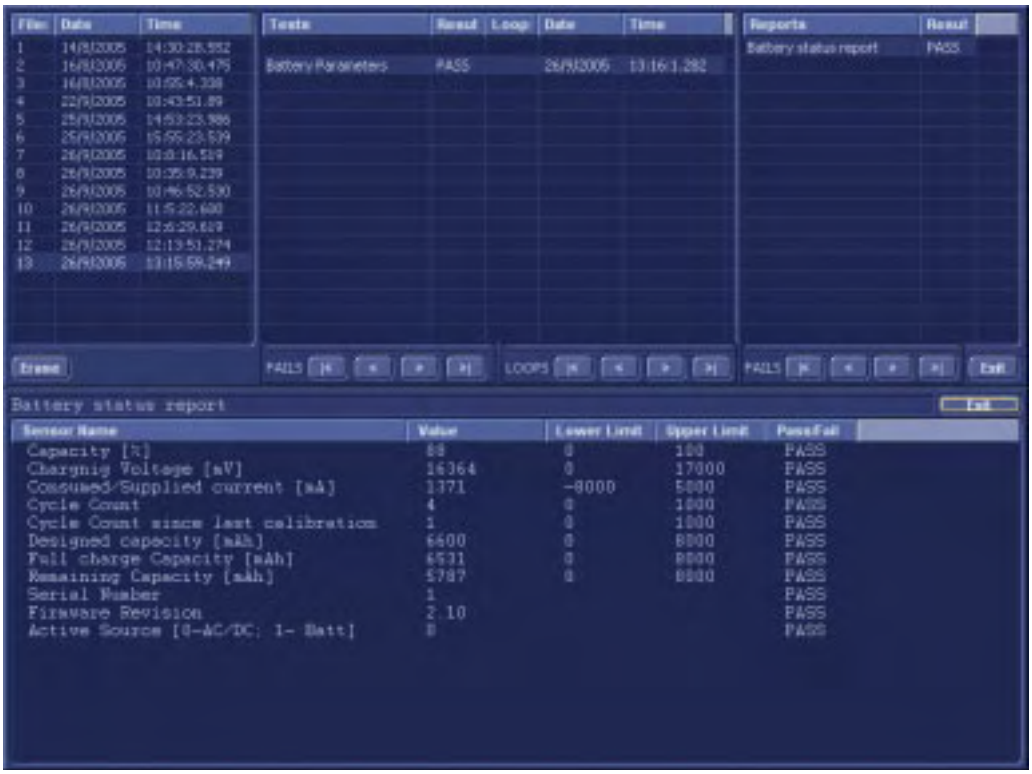

Battery Parameters
PASS
Battery status report
Battery status report
Exit
Capacity [%] 88 0 100 PASS
Charging Voltage [mV] 16364 0 17000 PASS
Consumed/Supplied current [mA] 1371 -8000 8000 PASS
Cycle Count 4 0 1000 PASS
Cycle Count since last calibration 1 0 1000 PASS
Designed capacity [mAh] 6600 0 8000 PASS
Full charge Capacity [mAh] 6531 0 8000 PASS
Remaining Capacity [mAh] 5787 0 8000 PASS
Serial Number 1 PASS
Firmware Revision 2.10 PASS
Active Source [0-AC/DC; 1- Batt] 0 PASS

Figure 7-70 View Test Log - Battery Parameters Test

Note: For this test, there is one report (Battery Status) which is listed in the *Reports* window on the right. By default, this report is displayed in the Reports window below.

7.) Check that the test passed and that result values for each sensor are within the pre-defined *Lower* and *Upper* limits, as shown in Figure 7-70.

8) When done, trackball to the **Exit** button and press **Set** to close the View Report window.

9) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified but the results were marginal, perform calibration, as described in DC Offset Calibration on page 7 - 24, and then repeat the test.

- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory)*.

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of this board is faulty. Contact your local GE medical systems field engineer for assistance.

10.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

11.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-5-1-6 Tx Voltages Test

NOTE: *For a description of this test, refer to the information in Tx Voltages Test on page 7 - 13.*

NOTICE **IMPORTANT** In order to access an individual board test, it is necessary to insert the service dongle from system boot-up and enter the Service Password.

1.) In the *Diagnostic Test* window, trackball to **Tx Voltages** in the list of *Monitoring* tests available for selection from the Diagnostic Test Tree (see Figure 7-71 below) and press **Set**. The Tx Voltages Test name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (AC/DC, Battery, PS), as shown below:

Figure 7-71 Tx Voltages Test

2.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.

3.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

4.) Trackball to the **Start** button and press **Set**.

The Tx Voltages Test commences. While the test proceeds, the name of the test currently in progress (Tx Voltages) is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.

- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

5.) At any stage, trackball to the **Pause** button and press **Set**, if required.

6.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the Tx Voltages Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests passed or failed, as shown in the example in Figure 7-72.

Figure 7-72 View Test Log - Tx Voltages Test

Note: For this test, there is one report (Tx Voltages) which is listed in the *Reports* window on the right. By default, this report is displayed in the Reports window below.

7.) Check that the test passed and that result values for each fan are within the pre-defined *Max* and *Min* voltage limits, as shown in Figure 7-72.

8) When done, trackball to the **Exit** button and press **Set** to close the View Report window.

9) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified but the results were marginal, perform calibration, as described in DC Offset Calibration on page 7 - 24, and then repeat the test.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory)*.

If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of this board is faulty. Contact your local GE medical systems field engineer for assistance.

10.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

11.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

Section 7-6
Performing Back End Diagnostics on the System

The Back End Diagnostics Tests enable you to test the functionality of various Back End hardware components.

Note: The Back End Diagnostic Tests may be performed independently, regardless of sequence.

7-6-1 Accessing the Back End Diagnostic Test Options

- Access the *Diagnostic Test* window, as described in the *Accessing the Front End Diagnostic Options* section, on page 7-24.

7-6-1-1 PC Doctor

NOTE: For a complete description of all PC Doctor tests, refer to the information in PC Doctor on page 7 - 14.

This procedures in this section are divided into two groups. Refer to the relevant procedure, as follows:

- **Automatic Tests**
  - Full Back End Test w/o Hard Disk Scan - see below
  - Full PC Doctor Test (50 min) on page 7 - 112
  - CPU Tests on page 7 - 114
  - HD Test on page 7 - 117
  - Memory Test on page 7 - 119
  - Video Test on page 7 - 121
  - PCI Test on page 7 - 123
  - Network Test on page 7 - 125

7-6-1-1-1 Full Back End Test w/o Hard Disk Scan

NOTE: For a description of this test, refer to Full Back End Test without Hard Disk on page 7 - 14.

1.) In the *Diagnostic Test* window, trackball to **Full Back End Test w/o Hard Disk Scan** in the list of *PC Doctor* tests available for selection from the Diagnostic Test Tree (see Figure 7-73 below) and press **Set**. The Test name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (BEP, Peripherals, Keyboard) , as shown below:

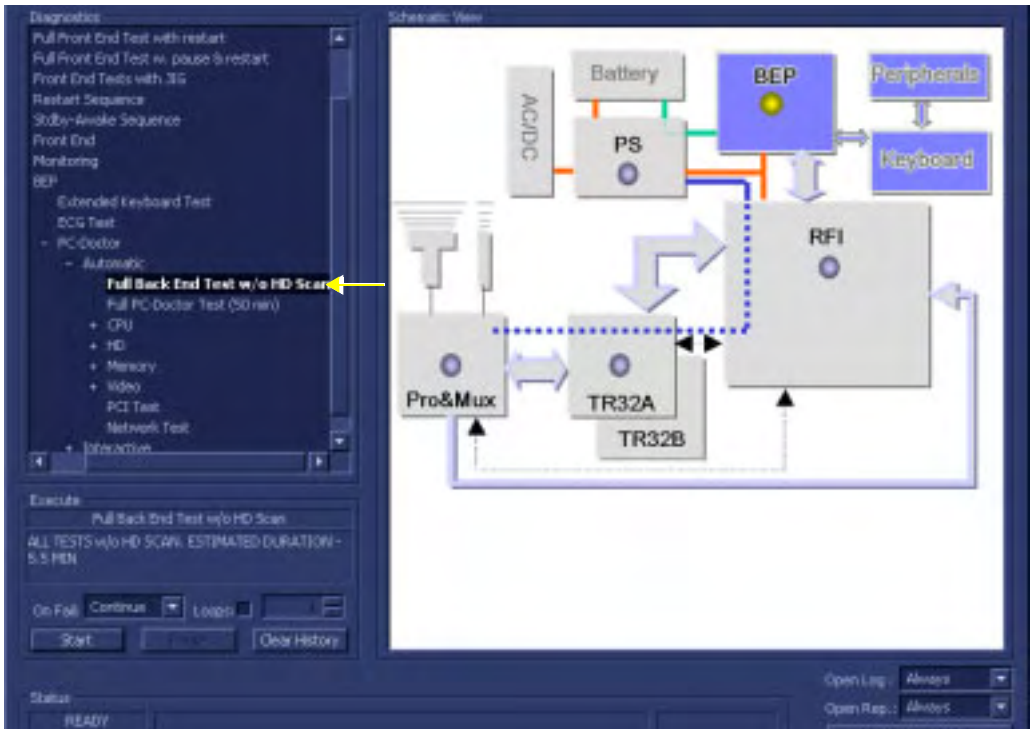


Figure 7-73 Full Back End Test w/o Hard Disk Scan

2.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.

3.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

4.) Trackball to the **Start** button and press **Set**.

The Full Back End Test w/o Hard Disk Scan commences. While the test proceeds, the name of the test currently in progress is displayed in the *Execute* field and the current *Loop* # and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

5.) At any stage, trackball to the **Pause** button and press **Set**, if required.

6.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the Full Back End Test w/o Hard Disk Scan sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests and sub-tests passed or failed, as shown in the example in Figure 7-74.

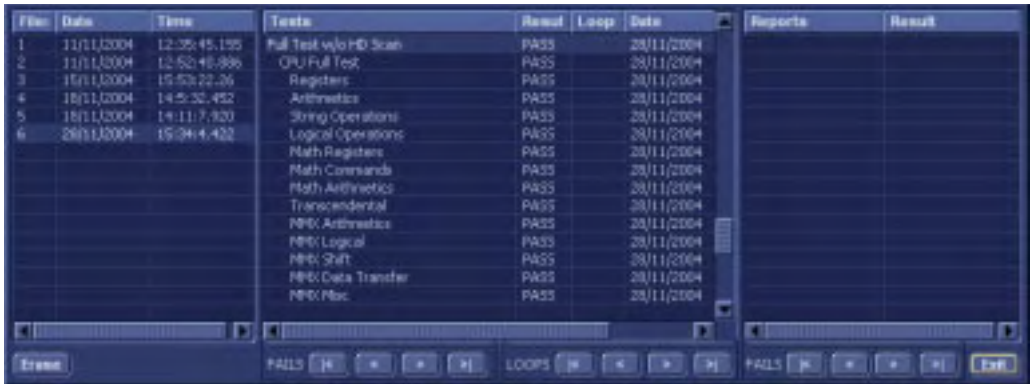


Figure 7-74 View Test Log - Full Back End Test w/o Hard Disk Scan

Note: For the Full Back End Test w/o Hard Disk Scan, many tests are performed in the test sequence; these are listed in the Tests window as shown in Figure 7-74. For each currently-selected test (for example, *CPU Full Test*) the corresponding report is listed in *Reports* on the right.
For details of each report, refer to the explanations provided in CPU Tests on page 7 - 114:

7.) Use the scroll bars and/or arrows to scroll through the list of *Test* results and review the reports, as required.

8) When done, trackball to the **Exit** button and press **Set** to close the View Report window.

9) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory).*

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of this board is faulty. Contact your local GE medical systems field engineer for assistance.

10.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

11.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-6-1-1-2 Full PC Doctor Test (50 min)

NOTE: For a description of this test, refer to the information in Full PC Doctor Test (50 min) on page 7 - 14.

1.) In the *Diagnostic Test* window, trackball to **Full PC Doctor Test** in the list of *PC Doctor* tests available for selection from the Diagnostic Test Tree (see Figure 7-75 below) and press **Set**. The Test name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (BEP, Peripherals, Keyboard) , as shown below:

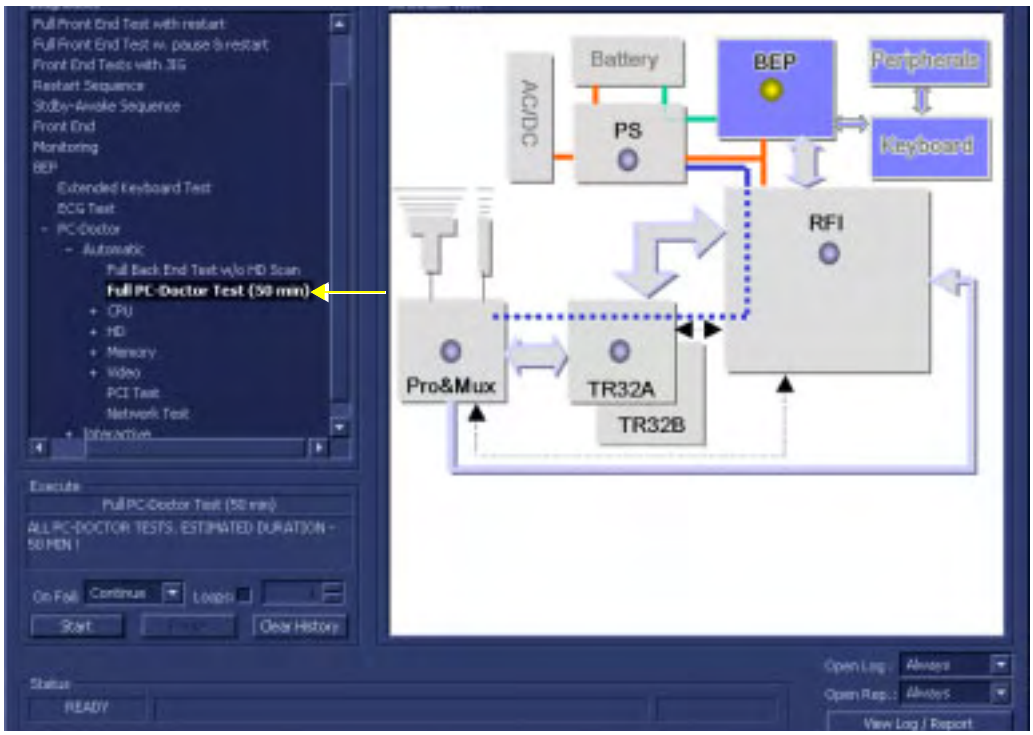


Figure 7-75 Full PC Doctor Test

2.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.

3.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

4.) Trackball to the **Start** button and press **Set**.

The Full PC Doctor Test commences. While the test proceeds, the name of the test currently in progress is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

5.) At any stage, trackball to the **Pause** button and press **Set**, if required.

6.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the Full PC Doctor Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests and sub-tests passed or failed, as shown in the example in Figure 7-74.

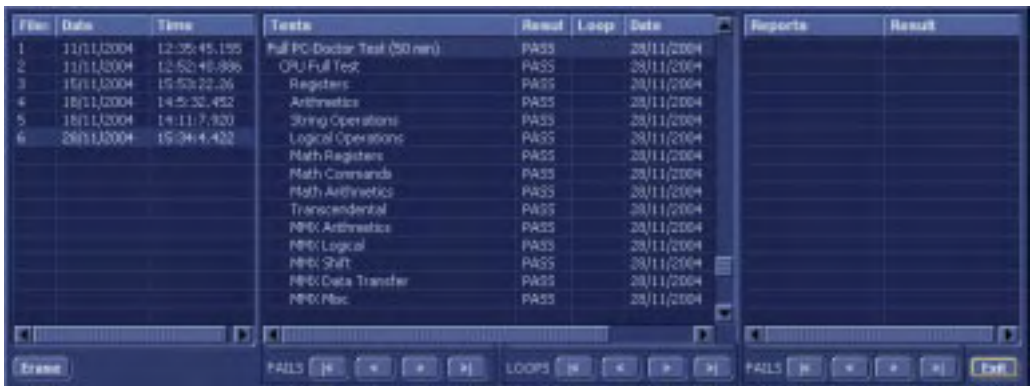


Figure 7-76 View Test Log - Full PC Doctor Test

Note: For the Full PC Doctor Test, many tests are performed in the test sequence; these are listed in the Tests window as shown in Figure 7-76. For each currently-selected test (for example, *CPU Full Test*) the corresponding report is listed in *Reports* on the right.
For details of each report, refer to the explanations provided in CPU Tests on page 7 - 114:

7.) Use the scroll bars and/or arrows to scroll through the list of *Test* results and review the reports, as required.

8) When done, trackball to the **Exit** button and press **Set** to close the View Report window.

9) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory).*

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of this board is faulty. Contact your local GE medical systems field engineer for assistance.

10.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

11.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-6-1-1-3 CPU Tests

NOTE: For a description of these tests, refer to the information in CPU Tests on page 7 - 14.

1.) In the *Diagnostic Test* window, trackball to **CPU Full Test** in the list of *CPU* tests available for selection from the Diagnostic Test Tree (see Figure 7-77 below) and press **Set**. The Test name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (BEP, Peripherals, Keyboard) , as shown below:

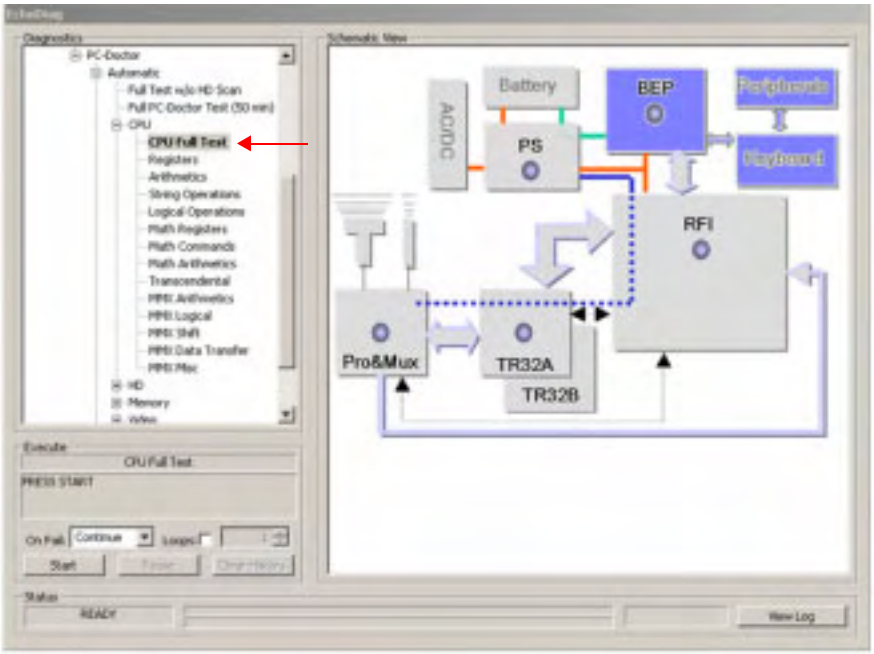


Figure 7-77 CPU Full Test

2.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.

3.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

4.) Trackball to the **Start** button and press **Set**.

The CPU Full Test commences. While the test proceeds, the name of the test currently in progress is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

5.) At any stage, trackball to the **Pause** button and press **Set**, if required.

6.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the CPU Full Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests and sub-tests passed or failed, as shown in the example in Figure 7-74.

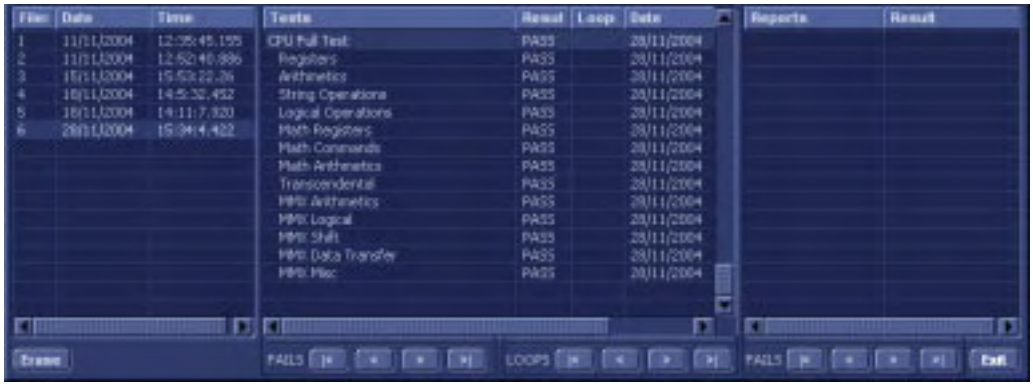


Figure 7-78 View Test Log - CPU Full Test

Note: For the CPU Full Test, many tests are performed in the test sequence; these are listed in the Tests window as shown in Figure 7-76. For each currently-selected test (for example, *Registers*) the corresponding report is listed in *Reports* on the right.

7.) Use the scroll bars and/or arrows to scroll through the list of *Test* results and review the reports, as required:

- CPU Registers
- CPU Arithmetics
- CPU String Operations
- CPU Logical Operations
- CPU Math Registers
- CPU Math Commands

- CPU Transcendental
- CPU MMX Arithmetic
- CPU MMX Logical
- CPU MMX Shift
- CPU MMX Data Transfer
- CPU MMX Misc.

8) When done, trackball to the **Exit** button and press **Set** to close the View Report window.

9) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory).*

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of this board is faulty. Contact your local GE medical systems field engineer for assistance.

10.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

11.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-6-1-1-4 HD Test

NOTE: For a description of these tests, refer to the information in HD Test on page 7 - 15.

1.) In the *Diagnostic Test* window, trackball to **Hard Drive Full Test w/o Scan** in the list of *HD* tests available for selection from the Diagnostic Test Tree (see Figure 7-79 below) and press **Set**. The Test name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (BEP, Peripherals, Keyboard) , as shown below:

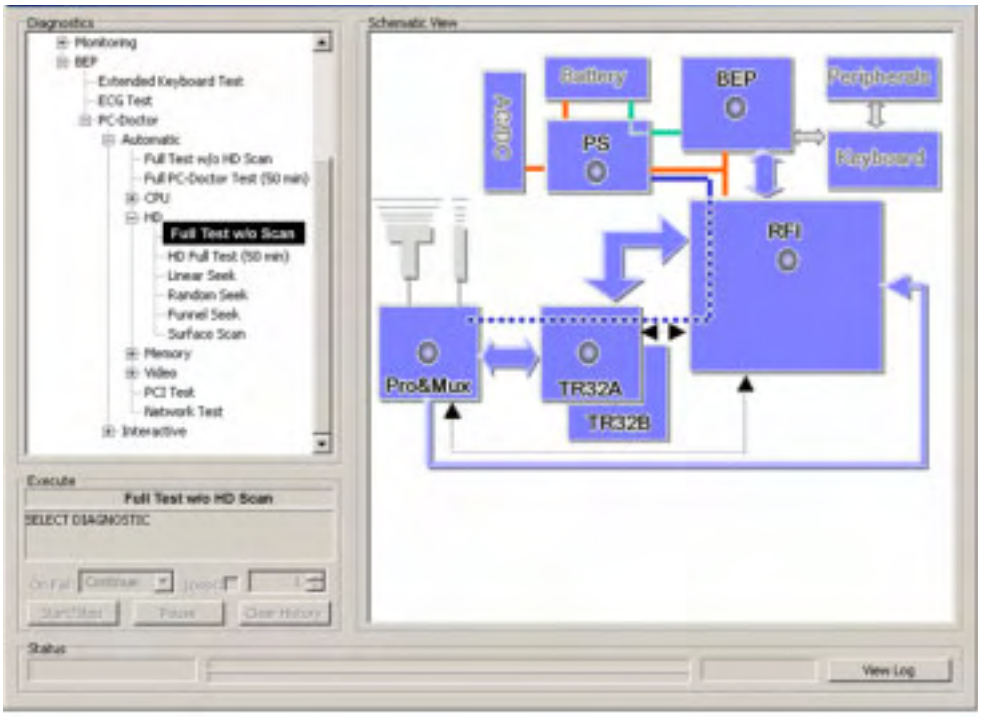
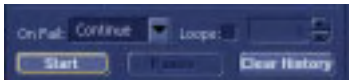


Figure 7-79 Hard Drive Full Test w/o Scan

2.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.



3.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

4.) Trackball to the **Start** button and press **Set**.

The Hard Drive Full Test w/o Scan commences. While the test proceeds, the name of the test currently in progress is displayed in the *Execute* field and the current *Loop* # and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

5.) At any stage, trackball to the **Pause** button and press **Set**, if required.

6.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the Hard Drive Full Test w/o Scan sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests and sub-tests passed or failed, as shown in the example in Figure 7-80.

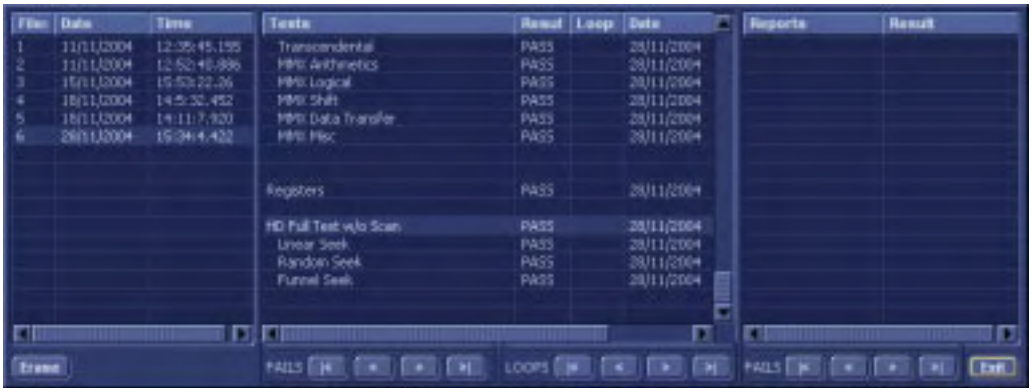


Figure 7-80 View Test Log - Hard Drive Full Test w/o Scan

Note: For the Hard Drive Full Test w/o Scan, several tests are performed in the test sequence; these are listed in the Tests window as shown in Figure 7-80. For each currently-selected test (for example, *Linear Seek*) the corresponding report is listed in *Reports* on the right.

7.) Use the scroll bars and/or arrows to scroll through the list of *Test* results and review the reports, as required:

- Linear Seek
- Random Seek
- Funnel Scan

8) When done, trackball to the **Exit** button and press **Set** to close the View Report window.

9) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory).*

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of this board is faulty. Contact your local GE medical systems field engineer for assistance.

10.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

11.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-6-1-1-5 Memory Test

NOTE: For a description of these tests, refer to the information in Memory Test on page 7 - 16.

1.) In the *Diagnostic Test* window, trackball to **Full Memory Test** in the list of *Memory* tests available for selection from the Diagnostic Test Tree (see Figure 7-81 below) and press **Set**. The Test name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (BEP, Peripherals, Keyboard), as shown below:

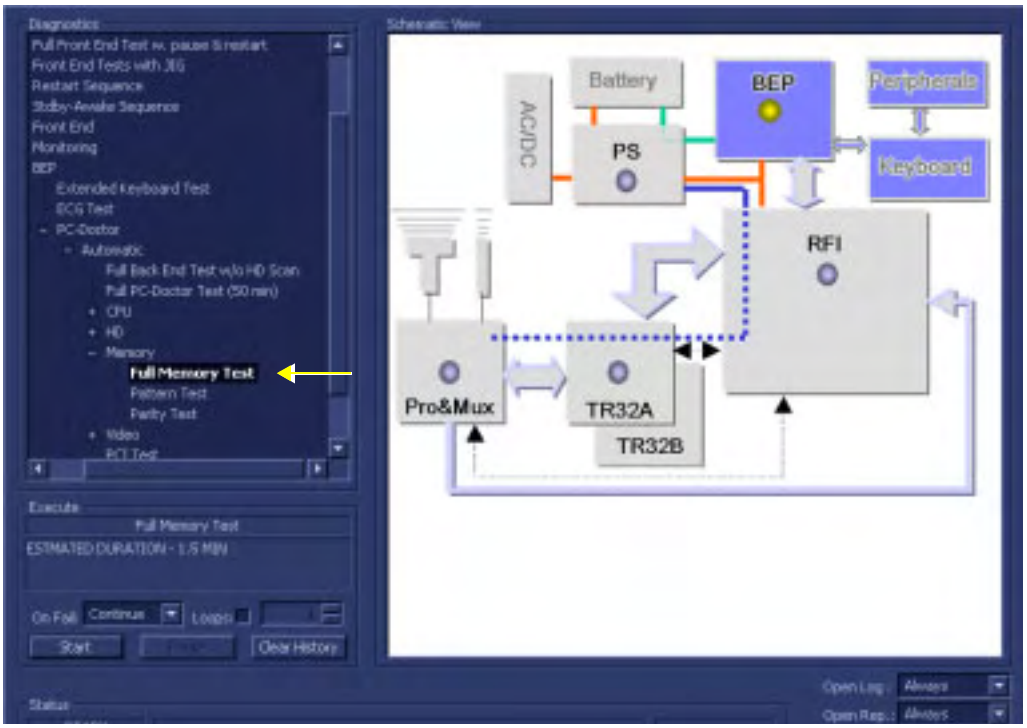


Figure 7-81 Full Memory Test

2.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.

3.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

4.) Trackball to the **Start** button and press **Set**.

The Full Memory Test commences. While the test proceeds, the name of the test currently in progress is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

5.) At any stage, trackball to the **Pause** button and press **Set**, if required.

6.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the Full Memory Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests and sub-tests passed or failed, as shown in the example in Figure 7-82.

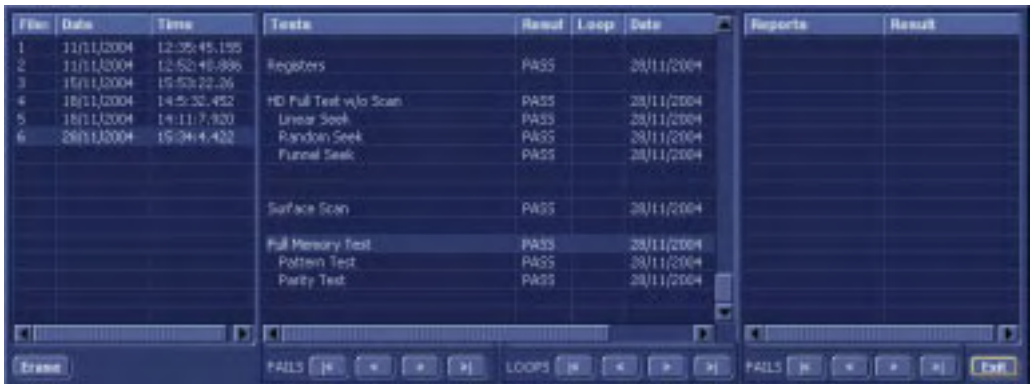


Figure 7-82 View Test Log - Full Memory Test

Note: For the Full Memory Test, several tests are performed in the test sequence; these are listed in the Tests window as shown in Figure 7-82. For each currently-selected test (for example, *Memory Pattern Test*) the corresponding report is listed in *Reports* on the right.

7.) Use the scroll bars and/or arrows to scroll through the list of *Test* results and review the reports, as required:

- Memory Pattern Test
- Memory Parity Test

8) When done, trackball to the **Exit** button and press **Set** to close the View Report window.

9) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory).*

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of this board is faulty. Contact your local GE medical systems field engineer for assistance.

10.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

11.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-6-1-1-6 Video Test

NOTE: For a description of these tests, refer to the information in Video Test on page 7 - 16.

1.) In the *Diagnostic Test* window, trackball to **Full Video Test** in the list of *Video* tests available for selection from the Diagnostic Test Tree (see Figure 7-81 below) and press **Set**. The Test name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (BEP, Peripherals, Keyboard), as shown below:

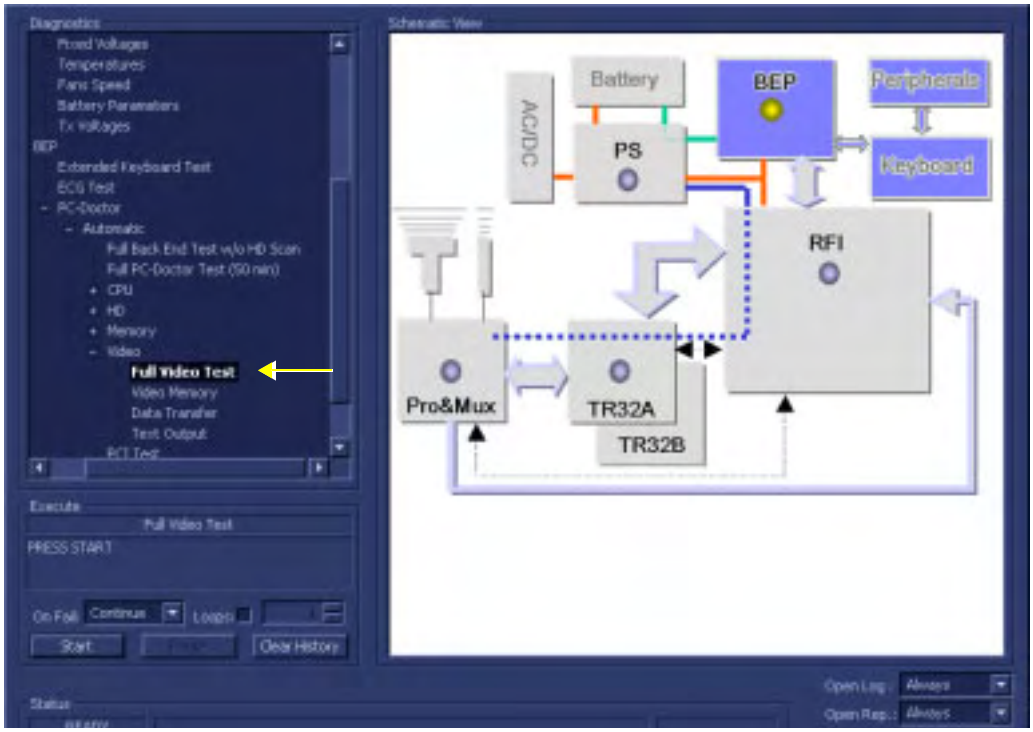


Figure 7-83 Full Video Test

2.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.

3.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

4.) Trackball to the **Start** button and press **Set**.

The Full Video Test commences. While the test proceeds, the name of the test currently in progress is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

5.) At any stage, trackball to the **Pause** button and press **Set**, if required.

6.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the Full Video Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests and sub-tests passed or failed, as shown in the example in Figure 7-84.

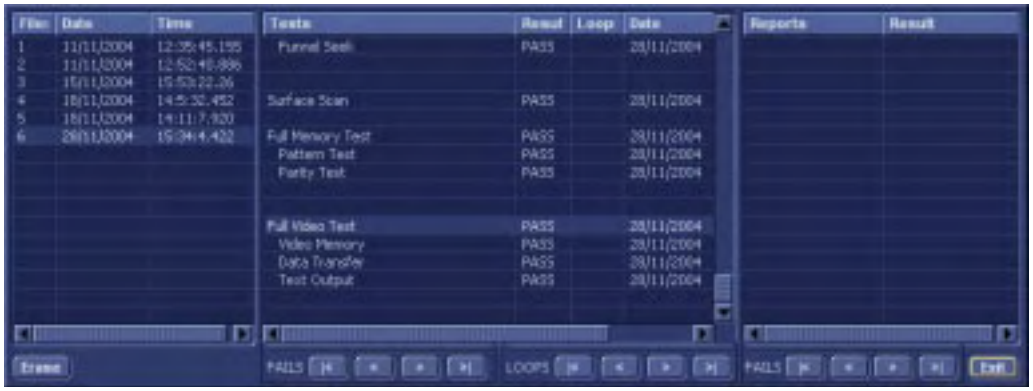


Figure 7-84 View Test Log - Full Video Test

Note: For the Full Video Test, several tests are performed in the test sequence; these are listed in the Tests window as shown in Figure 7-84. For each currently-selected test (for example, *Video Memory*) the corresponding report is listed in *Reports* on the right.

7.) Use the scroll bars and/or arrows to scroll through the list of *Test* results and review the reports, as required:

- Video Memory
- Video Data Transfer
- Video Text Output

8) When done, trackball to the **Exit** button and press **Set** to close the View Report window.

9) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory).*

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of this board is faulty. Contact your local GE medical systems field engineer for assistance.

10.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

11.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-6-1-1-7 PCI Test

NOTE: For a description of this test, refer to the information in PCI Test on page 7 - 16.

1.) In the *Diagnostic Test* window, trackball to **PCI Test** in the list of *PC Doctor* tests available for selection from the Diagnostic Test Tree (see Figure 7-85 below) and press **Set**. The Test name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (BEP, Peripherals, Keyboard), as shown below:

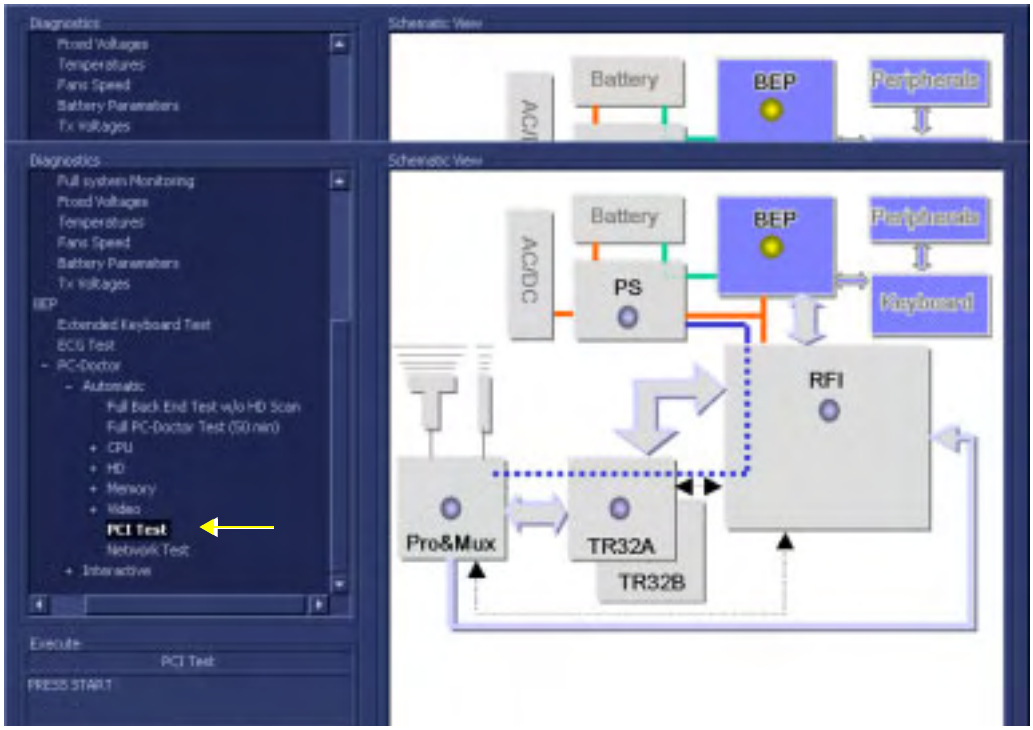


Figure 7-85 PCI Test

2.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.

3.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

4.) Trackball to the **Start** button and press **Set**.

The PCI Test commences. While the test proceeds, the name of the test currently in progress is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

5.) At any stage, trackball to the **Pause** button and press **Set**, if required.

6.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the PCI Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests and sub-tests passed or failed, as shown in the example in Figure 7-82.

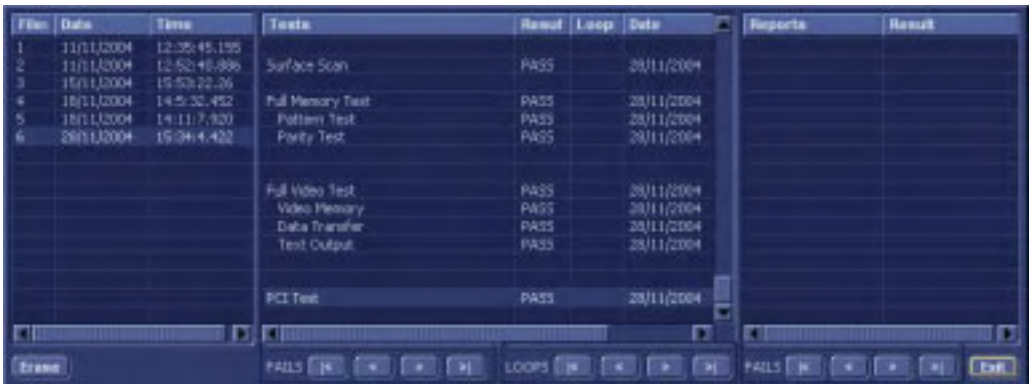


Figure 7-86 View Test Log - PCI Test

Note: For the PCI Test, there is one report which is listed in the Tests window as shown in Figure 7-86.

7) When done, trackball to the **Exit** button and press **Set** to close the View Report window.

8) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory)*.

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of this board is faulty. Contact your local GE medical systems field engineer for assistance.

9.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

10.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

7-6-1-1-8 Network Test

NOTE: For a description of this test, refer to the information in Network Test on page 7 - 16.

1.) In the *Diagnostic Test* window, trackball to **Network Test** in the list of *PC Doctor* tests available for selection from the Diagnostic Test Tree (see Figure 7-87 below) and press **Set**. The Test name is displayed under *Execute;* the relevant system components to be tested are highlighted light blue in the Schematic View (BEP, Peripherals, Keyboard), as shown below:

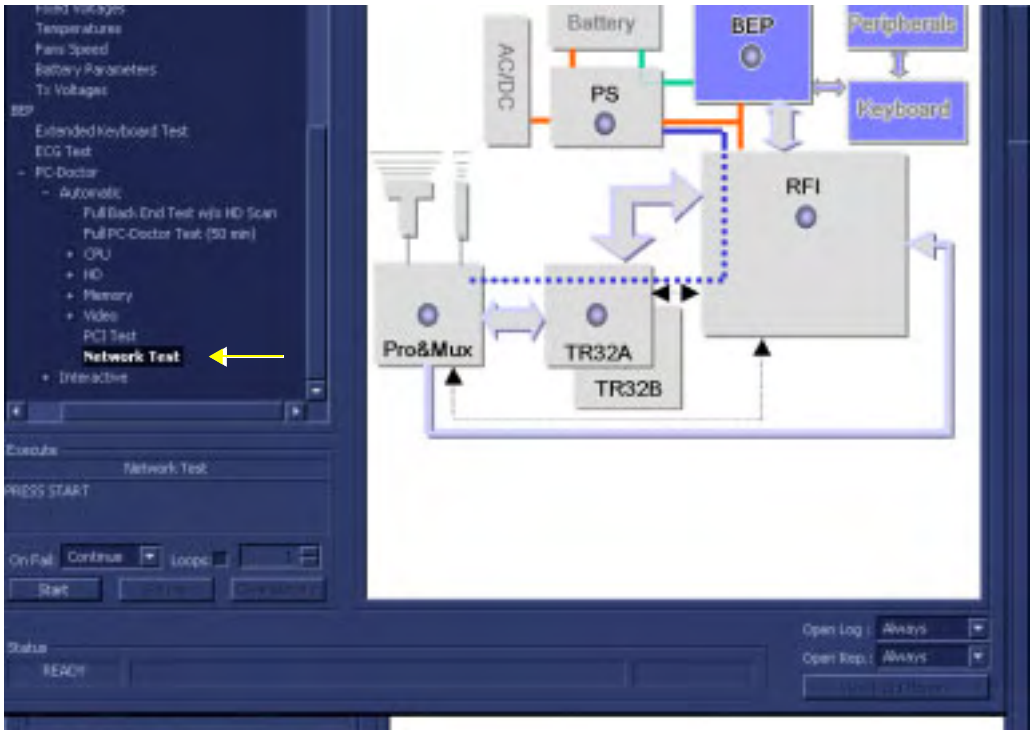
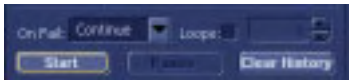


Figure 7-87 Network Test

2.) Under the *Special Instructions* area, activate the **Loops** checkbox and select the required number of *Loops* from the combo box.



3.) Adjacent to *On Fail,* select either **Stop** or **Continue**, as required. Stopping on failure enables you to review a failed test, the moment it fails. Alternatively, you may prefer testing to continue on failure and later you may review the report.

4.) Trackball to the **Start** button and press **Set**.

The Network Test commences. While the test proceeds, the name of the test currently in progress is displayed in the *Execute* field and the current *Loop #* and specific test are shown below. The messages *Init Done* and *Please Wait* are displayed beside the progress bar in the *Status* area.

As the testing sequence progresses, the progress bar will advance to reflect the test progress. Status indicators in the Data Flow map corresponding to the various system components will be highlighted in the appropriate color to indicate the current test status, as follows:

- **Green:** All recommended tests for these components have been completed and no problems were identified.
- **Red:** Problems were identified in these components during the performance of the test.
- **Yellow:** The tests executed so far on these components have passed, but not all recommended tests have been performed.

5.) At any stage, trackball to the **Pause** button and press **Set**, if required.

6.) To resume testing (from the point where you paused), trackball to the **Start** button and press **Set**.

When the Network Test sequence is complete:

- the *Diagnostic Test* window displays the Finished message
- the View Test Log window opens automatically, listing all tests performed and showing details of which tests and sub-tests passed or failed, as shown in the example in Figure 7-88.

Figure 7-88 View Test Log - Network Test

Note: For the Network Test, there is one report which is listed in the Tests window as shown in Figure 7-88.

7) When done, trackball to the **Exit** button and press **Set** to close the View Report window.

8) After reviewing the test results, proceed as follows:

- If no problems were identified, it is recommended to re-boot the system (this is obligatory when prompted).
- If no problems were identified but the problem persists, contact your local GE Medical Systems field engineer for assistance.
- If errors were identified and the results were not marginal, verify that all system cables and boards are connected (not misplaced) and functioning properly, as described in *Chapter 5 - Components and Function (Theory).*

  If the problem persists, this indicates that either the specific board you tested is faulty or that another board that supports the operation of this board is faulty. Contact your local GE medical systems field engineer for assistance.

9.) Trackball to the **Exit** button and press **Set** to close the *View Test Log* dialog box.

10.) Press the <**Esc**> button on the keyboard to close the Diagnostic *Test Window*.

Section 7-7
Common Service Interface

NOTE: The Common Service Interface uses the Windows version of PC-Doctor.

The Service Platform contains a set of software modules that are common to many of GE Medical Systems' ultrasound and cardiology systems. This web-enabled technology provides linkage to e-Services, e-Commerce and the iCenter, making GE Medical Systems' scanners more e-enabled than ever.

7-7-1 iLinq Interactive Platform Features

Many of the services of the Common Service Platform come from its integration with iLinq. The following list briefly describes iLinq's features:

- **Web Server/Browser:** Used by the Service Platform, as well as other Service Software.
- **Connectivity:** Provides basic connectivity between the scanner and the OnLine Center (OLC) or the field engineer in the field.
- **Configuration:** Provides the interface to configure the various iLinq parameters.
- **Contact GE:** Enables the user to contact the OnLine Center and describe the problems with their scanner in an easy and convenient way, using a one-touch switch.
- **Interactive Application:** Displayed in the form of HTML pages each time the browser starts. This is the entry point for any user to start any iLinq application.

7-7-2 Global Service User Interface

The Global Service User Interface (GSUI) is the pattern for the user interface. This interface standard is followed by all modalities to achieve a common look and feel across all GE Medical Systems products.

The user interfaces provided by the service platform are designed for GE Medical Systems personnel and, as such, are in *English* only. At this time there is no multilingual capacity built into the Common Service Interface.

7-7-2-1 Service Log In

1) From the Scanning Screen, trackball to the wrench icon in the status bar at the bottom of the screen and press **Select**.

2) Wait a while until the *Service Login* dialog box is displayed, as shown below:

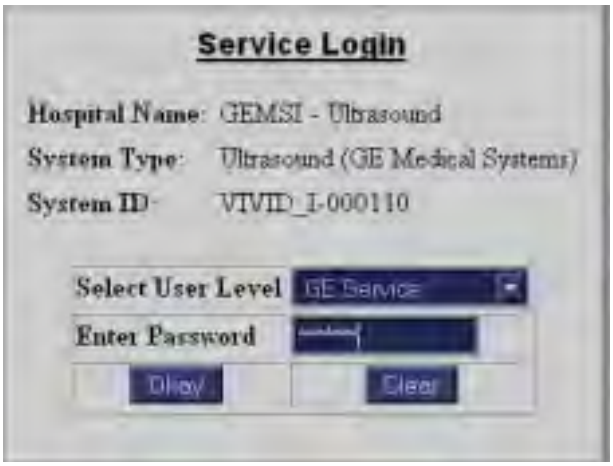


Figure 7-89 Service Login Dialog Box

3) Select **Operator** from the **Select User Level** drop-down list, and in the **Enter Password** field, enter the password supplied by the OLC (this is updated on a frequent basis).

Note: For a detailed description of the access and security levels, refer to the *Access and Security* section, on page 7-130.

4) Trackball to the **Okay** button and press **Select**. The *GEMS Service Home Page* window is displayed, as shown below:

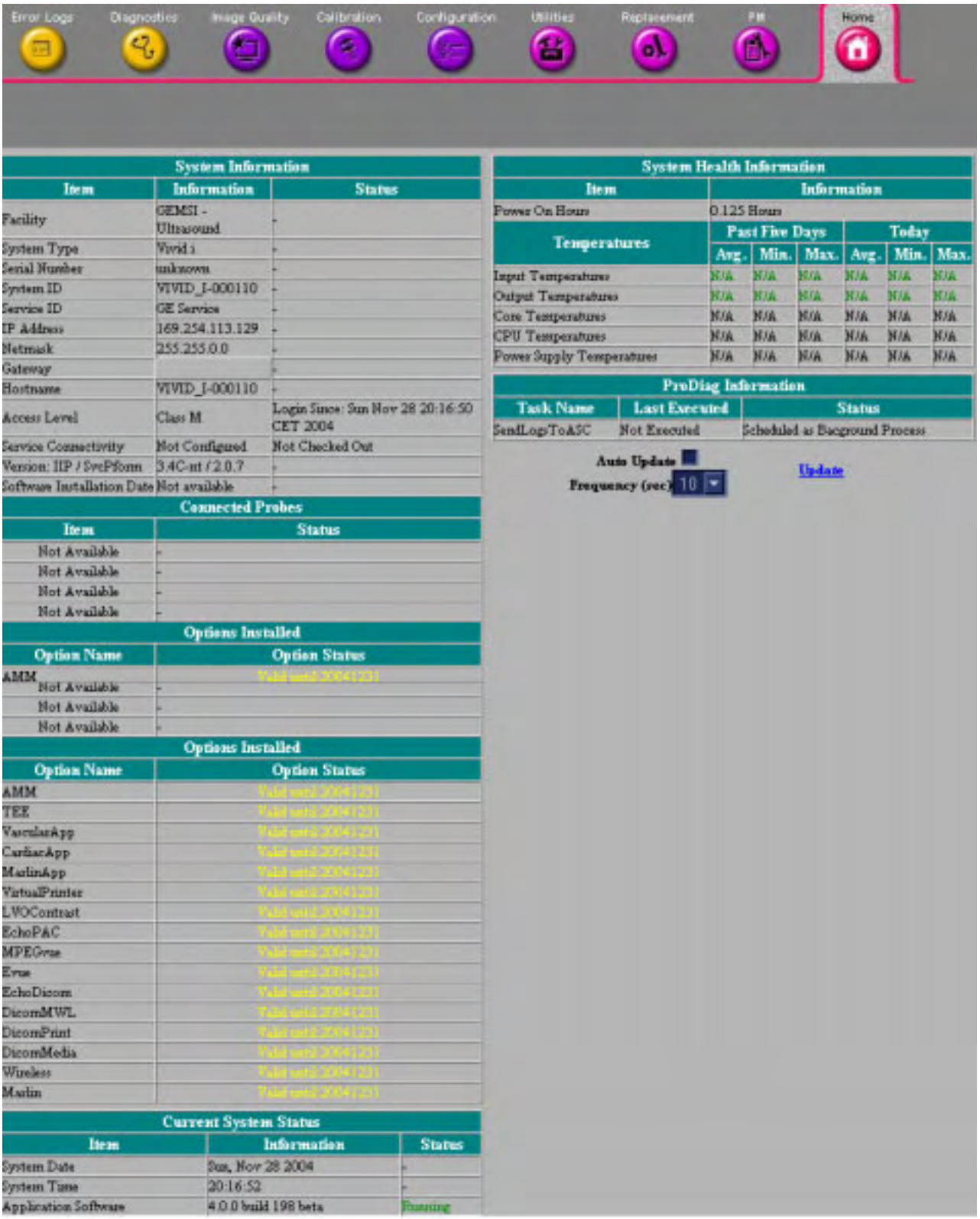


Figure 7-90 GEMS Service Home Page Window

The *GEMS Service Home Page* window contains details of the system location, the system IP address, the application status and other status information about the system. The navigation bar at the top of the page enables you to select the required tool or application, as described in the following sections:

- *Error Logs Page* section, on page 7-131.
- *Diagnostics Page* section, on page 7-136.
- *Image Quality Page* section, on page 7-149.
- *Calibration Page* section, on page 7-149.
- *Configuration Page* section, on page 7-150.
- *Utilities Page* section, on page 7-151.
- *Replacement Page* section, on page 7-164.
- *PM Page* section, on page 7-164.

Note: When using the Common Service Desktop, do not iconify any of the *Common Service Desktop* windows, as they will be located in the bottom-left corner of the screen (behind the *Service Desktop Manager* window) and cannot be restored. Resize the windows with the mouse, and move them as required to make room for other windows.

7-7-2-2 Access and Security

The service interface has various different security and user levels. Users are only granted access to the tools they are authorized to use, as described in the following table:

Table 7-1: Access and Security

User Level	Access Authorization
Operator	Normally used in-house and protected with a special scanner configuration that is not allowed to leave the facility.
Administrator	Use the OLC access method provided by iLinq.
External Services	Access is protected with a physical media key (typically a CD-ROM) and a password. The contents of the media key determine the level of access and the period of time for which access is granted.
GE Service	Requires a network connection, a physical media key and knowledge of the password.

All access to the service interface is via the Network port, except for iLinq. A modem on the scanner is specifically intended for iLinq use. Every access request, whether successful or not is logged in a service access log that can be viewed by authorized users.

7-7-3 Error Logs Page

When the *Error Logs* page is selected (as shown in Figure 7-91 below), the log viewing options described in the *Log Viewer* section, below are available:.

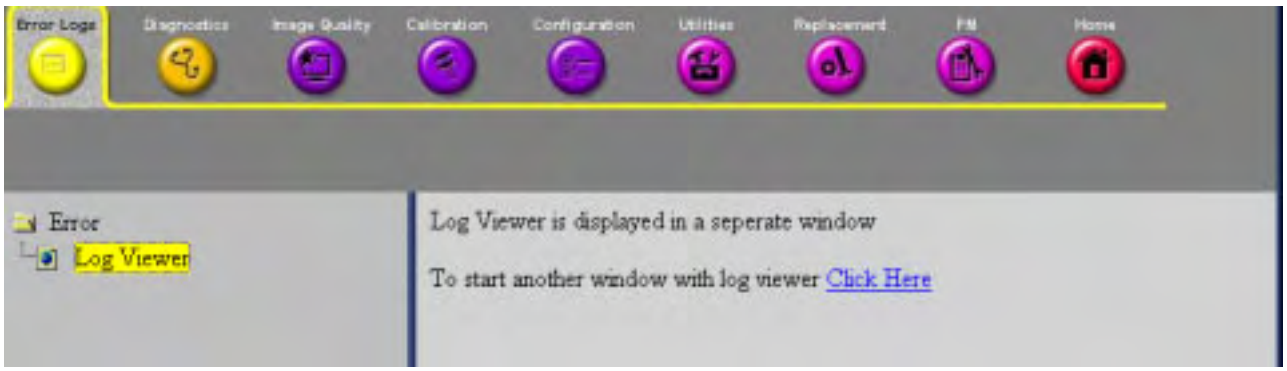


Figure 7-91 Error Logs Page

7-7-3-1 Log Viewer

When the **Log Viewer** option is selected in the left pane of the *Error Logs* page, the following five categories are displayed, each of which enable you to view a number of different system logs.

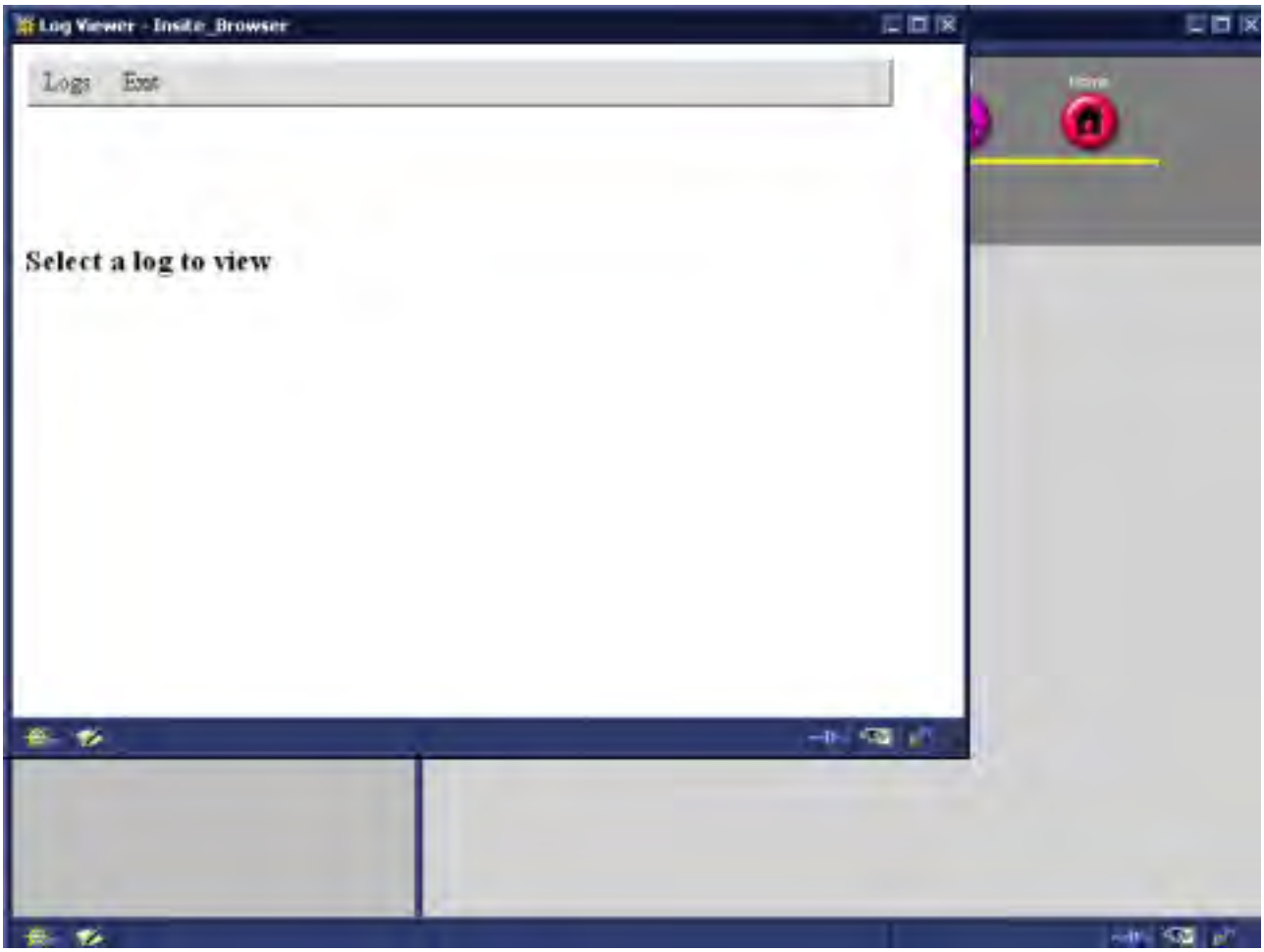


Figure 7-92 Log Viewer

The **Log Viewer** is driven by the following high-level requirements:

- Simple filtering of the scanner log(s) with filtering capabilities as a function of login access permissions.
- Log visibility by all services modes.
- Multiple instances of the log viewer.
- Color-coded log entries for severity levels, as follows:
  - Severity 1 - Green
  - Severity 2 - Yellow
  - Severity 3 - Red
- Support the transfer of logs to local or remote destinations.

7-7-3-1-1 Logs

The **Logs** option on the **Logs Viewer** menu enables you to view the following logs:

- **System:** Displays all the system logs, including errors and additional details, as shown below:

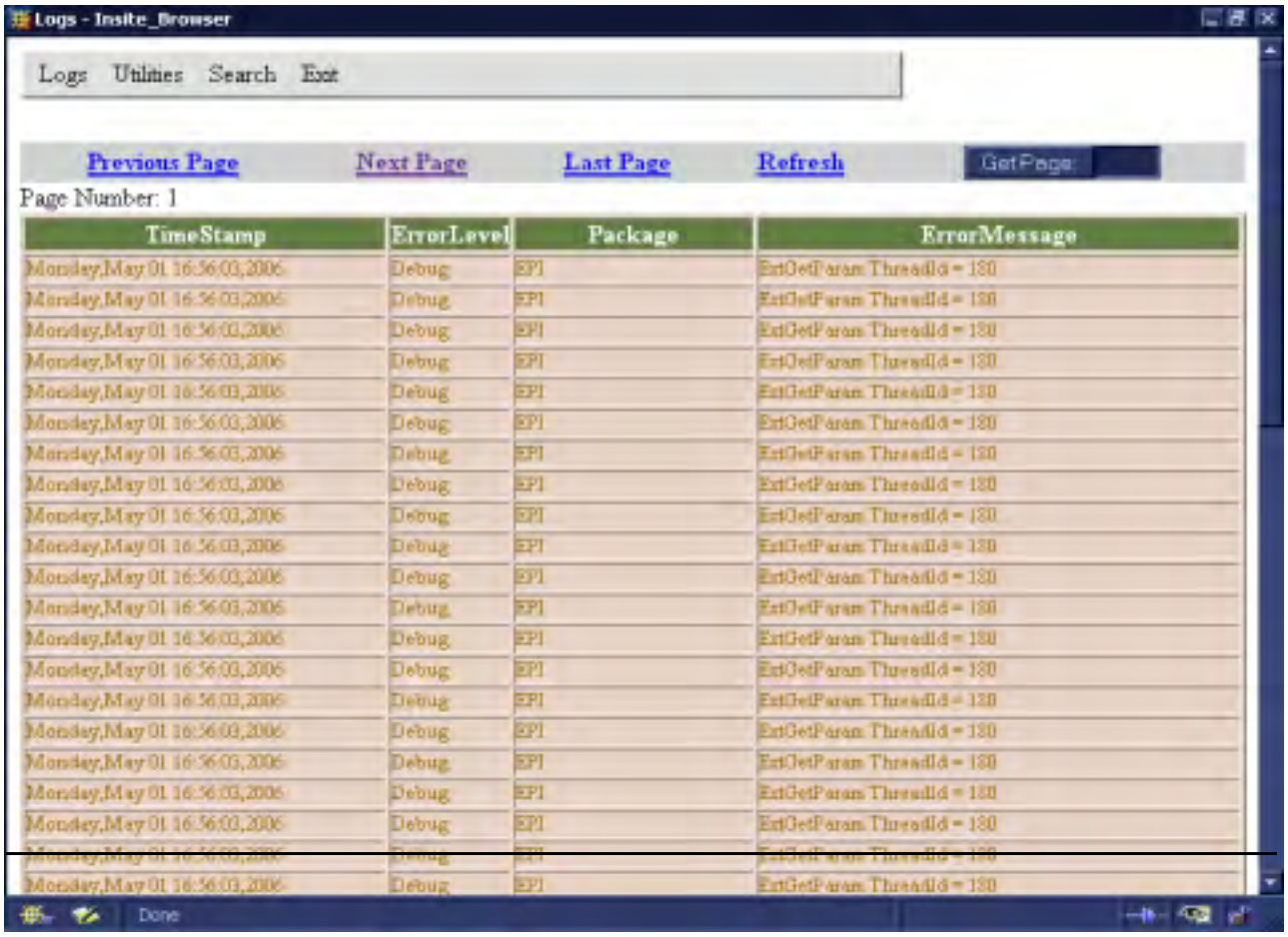


Figure 7-93 System Logs

- **Power:** Displays all the power logs, including errors, monitoring dates and values, as shown below:

Logs - Insite_Browser
Logs Utilities Search Exit
Previous Page Next Page Last Page Refresh Get Page:
Page Number: 1
TimeStamp ErrorLevel Analog_5V DC_5V DC_3.3V Pos_15V Analog_12V Pos_HV Neg_5V Pos_100V

Figure 7-94 Power Logs

- **Temperature:** Displays all the temperature logs, including errors, monitoring dates and values, as shown below:

Logs - Insite_Browser
Logs Utilities Search Exit
Previous Page Next Page Last Page Refresh Get Page:
Page Number: 1
TimeStamp ErrorLevel Package Average TD0 TD1 TD2 TD3 TD4 TD5 TD6 TD7 EQ Out EQ In RFI

Figure 7-95 Temperature Logs

NOTE: Upper FEC Sensor = sensor inside the Front End
Lower FEC Sensor = sensor inside the AC Distribution Box

7-7-3-1-2 Utilities

The **Utilities** option on the **Logs Viewer** menu enables you to access the following log utilities:

- **Plot Log:** Enables you to view the results of the Temperature or Power logs in graphical format. Select **Power** or **Temperature** from the **Log** option on the **Logs Viewer** menu, and then select **Plot Log** to display the results as shown below:

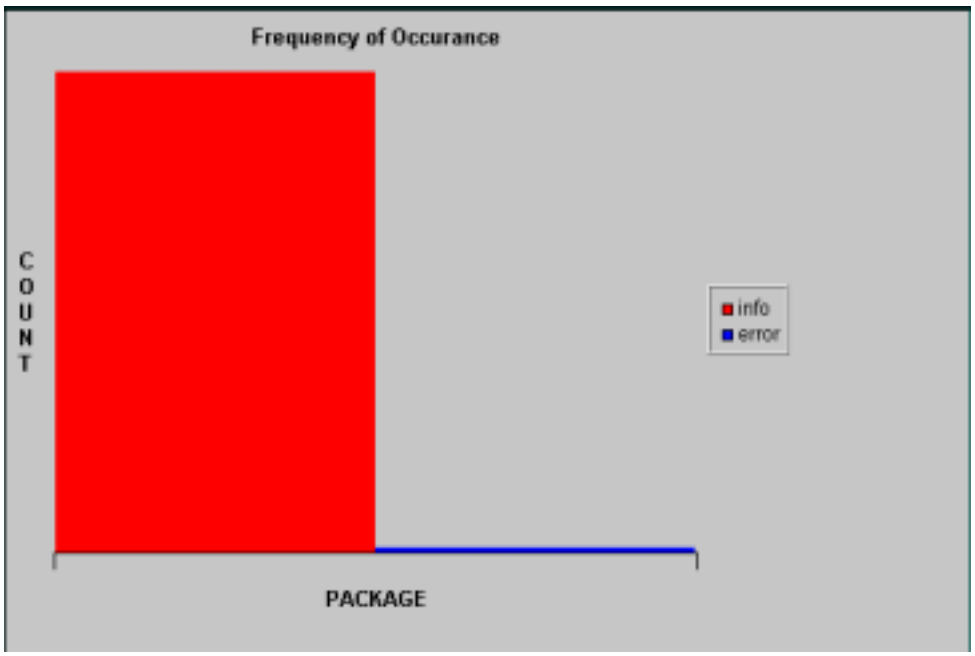


Figure 7-96 Plot Log Window

- **Plot Page:** Enables you to view the results of the System log in graphical format, showing the distribution of the log information according to packages. Select **System** from the **Log** option on the **Logs Viewer** menu, and then select **Plot Page** to display the results as shown below:

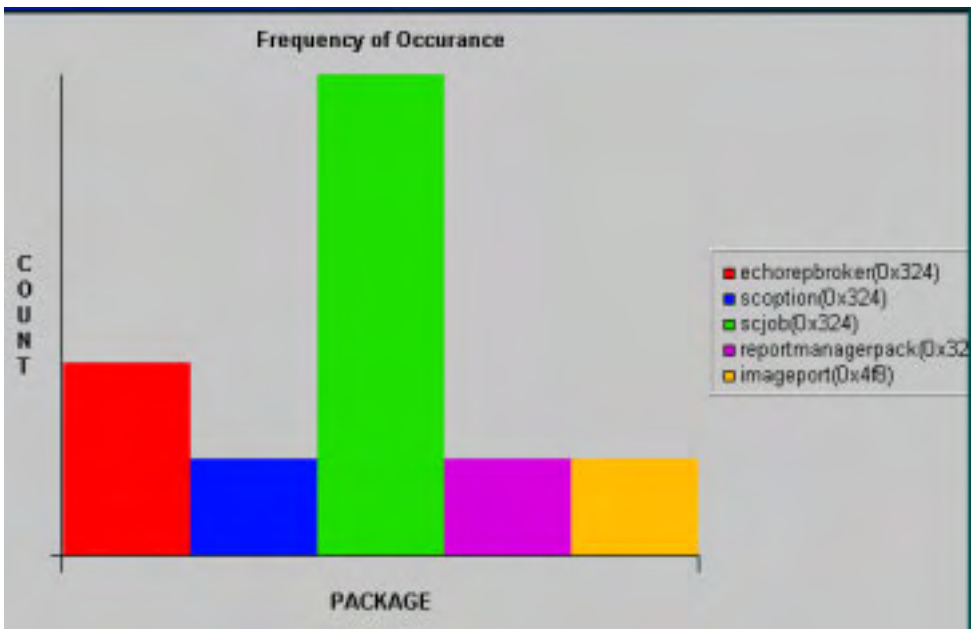


Figure 7-97 Plot Page Window

7-7-3-1-3 Search

The **Search** option on the **Logs Viewer** menu enables you to enter case-sensitive text that you want to filter from the logs or pages that you are currently viewing, as shown below:

Figure 7-98 Search for Text in Log or Page

7-7-3-1-4 Exit

The **Exit** option on the **Log Viewer** menu enables you to exit the **Log Viewer**. Select the **Exit Log Viewer** option to return to the Common Service Desktop.

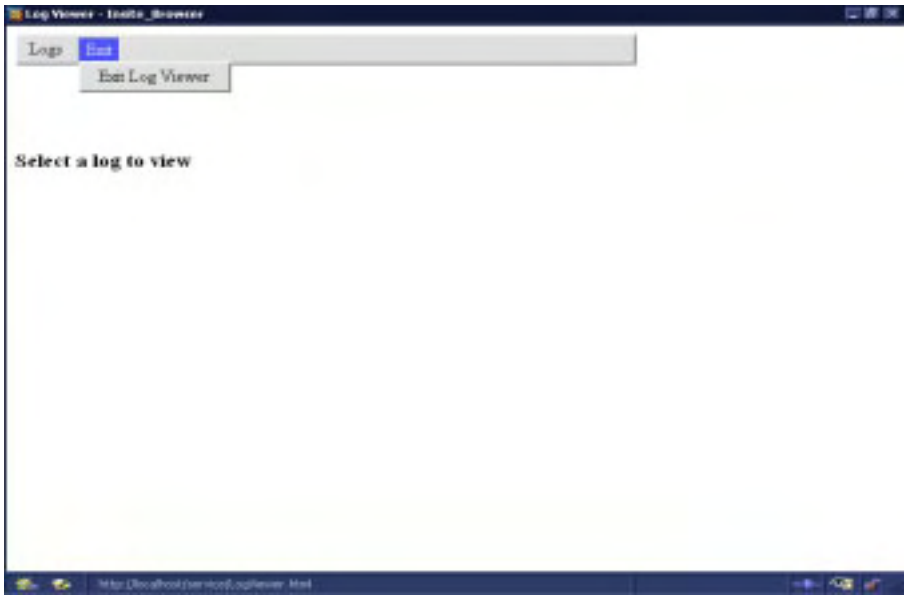


Figure 7-99 Exit Option

7-7-4 Diagnostics Page

The service platform uses a web-controlled user interface to provide access to common service components and perform diagnostics. There are two types of diagnostics:

- **Interactive:** The user is required to perform an operation on the ultrasound unit in order for the test to be completed successfully. This option is not applicable when used remotely.
- **Non-Interactive:** The tests are performed without the user's intervention.

The *Diagnostics* page is illustrated in Figure 7-100 (see next page). For an overview of the tools and controls provided, refer to Diagnostics Page Overview on page 7 - 138.

When the *Diagnostics* page is selected, the options described in the following sections are available:

- **Vivid-i™ Diagnostics**
  - Front End on page 7 - 139
  - Monitoring on page 7 - 139
- **Common Diagnostics**
  - Utilities on page 7 - 140
  - PC Diagnostics on page 7 - 142

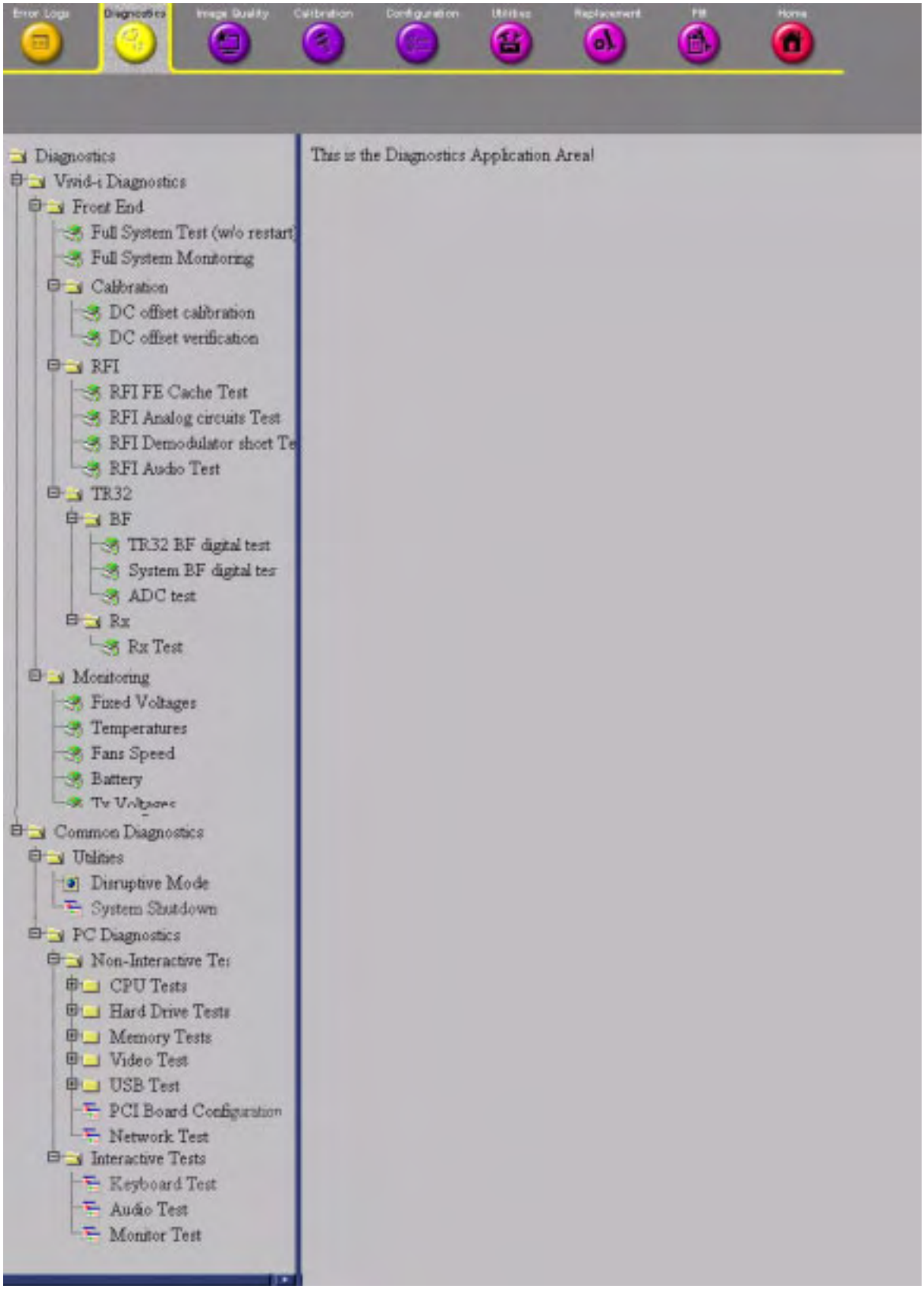


Figure 7-100 Diagnostics Page

7-7-4-1 Diagnostics Page Overview

When a test is selected in the left pane of the *Diagnostics* page, the right pane is divided into three frames (areas), as shown in Figure 7-101 below.

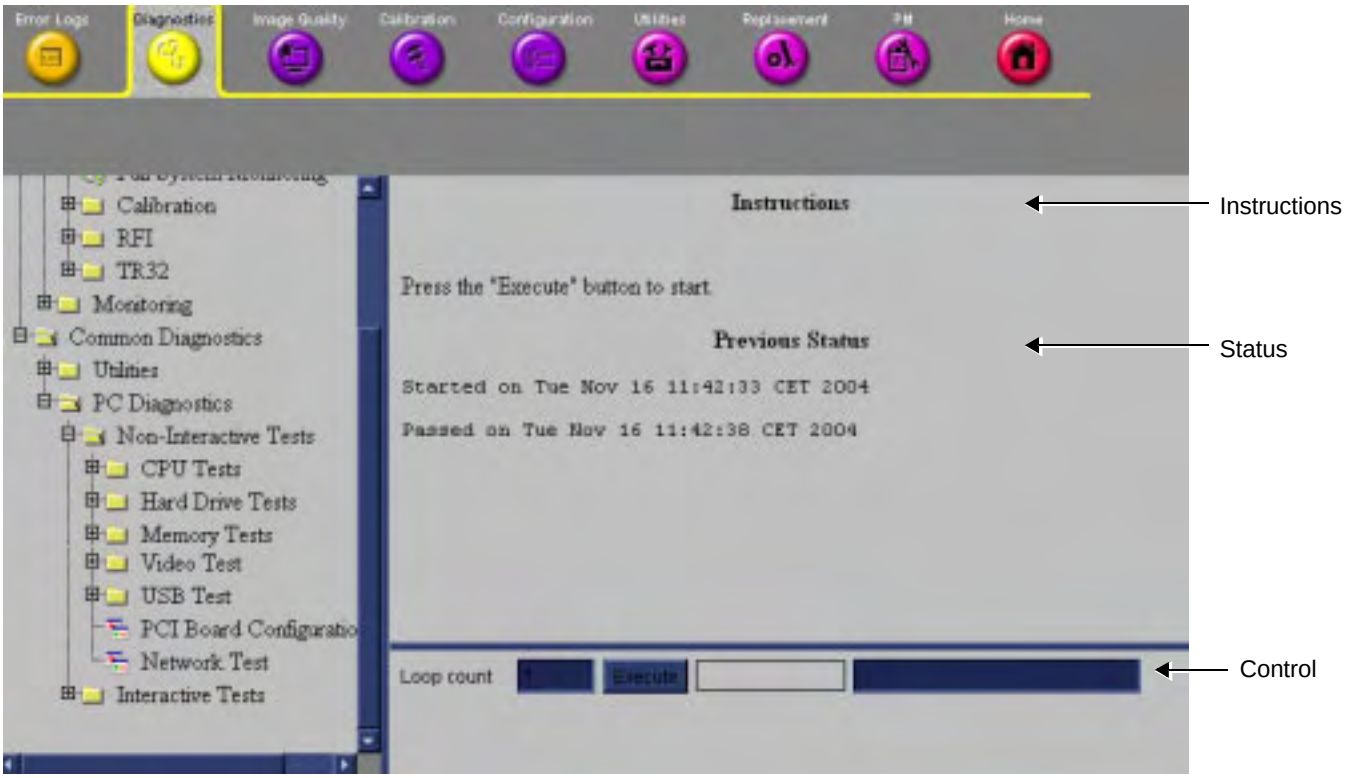


Figure 7-101 Diagnostics Page Overview

7-7-4-1-1 Instructions Frame

The Instructions frame displays a test-specific HTML page, or the default instructions HTML page.

7-7-4-1-2 Status Frame

The Status frame displays the last known status for the particular diagnostic. When a new diagnostic test is performed, the Status frame displays the current status of all test results.

7-7-4-1-3 Control Frame

The Control frame enables you to control the diagnostics and provide feedback. The background color of the Control frame is initially grey. Upon completion of a diagnostic, the background color changes to indicate the completion status - either Red (fail), Green (pass) or Grey (abort).

- **Execute Button:** Enables you to start a selected diagnostic test. Once the diagnostic is running, the Execute button becomes the Abort button, enabling you to stop the diagnostic.
- **Loop Count Field:** Enables you to enter the number of times that the diagnostic test should be performed. Any numeric value between one and four digits can be entered. This field is queried after you press **Execute** to start a diagnostic test.
- **Text Field:** Displays a short starting or aborting message, as well the diagnostic completion status.
- **Progress Indicator:** Displays the test progress.

7-7-4-2 Vivid-i™ Diagnostics

7-7-4-2-1 Front End

When the **Front End** option is selected in the left pane of the *Diagnostics* page, the following tests can be performed (refer to these procedure instructions):

-

- **Calibration**
  - DC Offset Calibration on page 7 - 24
  - DC Offset Verification on page 7 - 27
- **RFI**
  - RFI FE Cache Test on page 7 - 33
  - RFI Analog Circuits Test on page 7 - 36
  - RFI Demodulator Short Test on page 7 - 39
  - RFI Audio Test on page 7 - 42
- **TR32**
  - TR32 BF Digital Test on page 7 - 45
  - System BF Digital Test on page 7 - 48
  - ADC Test on page 7 - 51
- **RX**
  - RX Test on page 7 - 56

7-7-4-2-2 Monitoring

When the **Monitoring** option is selected in the left pane of the *Diagnostics* page, the following tests can be performed (refer to these procedure instructions):

- **Monitoring**
  - Fixed Voltages Test on page 7 - 94
  - Temperatures Test on page 7 - 97
  - Fans Speed Test on page 7 - 100
  - Battery Parameters Test on page 7 - 103
  - Tx Voltages Test on page 7 - 106

7-7-4-3 Common Diagnostics

7-7-4-3-1 Utilities

When the **Utilities** option is selected in the left pane of the *Diagnostics* page, the following operations can be performed:

- **Disruptive Mode:** Enables you to put the unit into Disruptive Mode, required in order to perform all the Front End diagnostics, as described in the *PC Diagnostics* section, on page 7-142. When this mode is requested by the OLC or by the field engineer, the user will be asked to confirm Disruptive Mode by clicking the **Yes** button, as shown below:

Figure 7-102 Request for Disruptive Mode

- **System Shutdown:** Enables you to enter system shutdown:

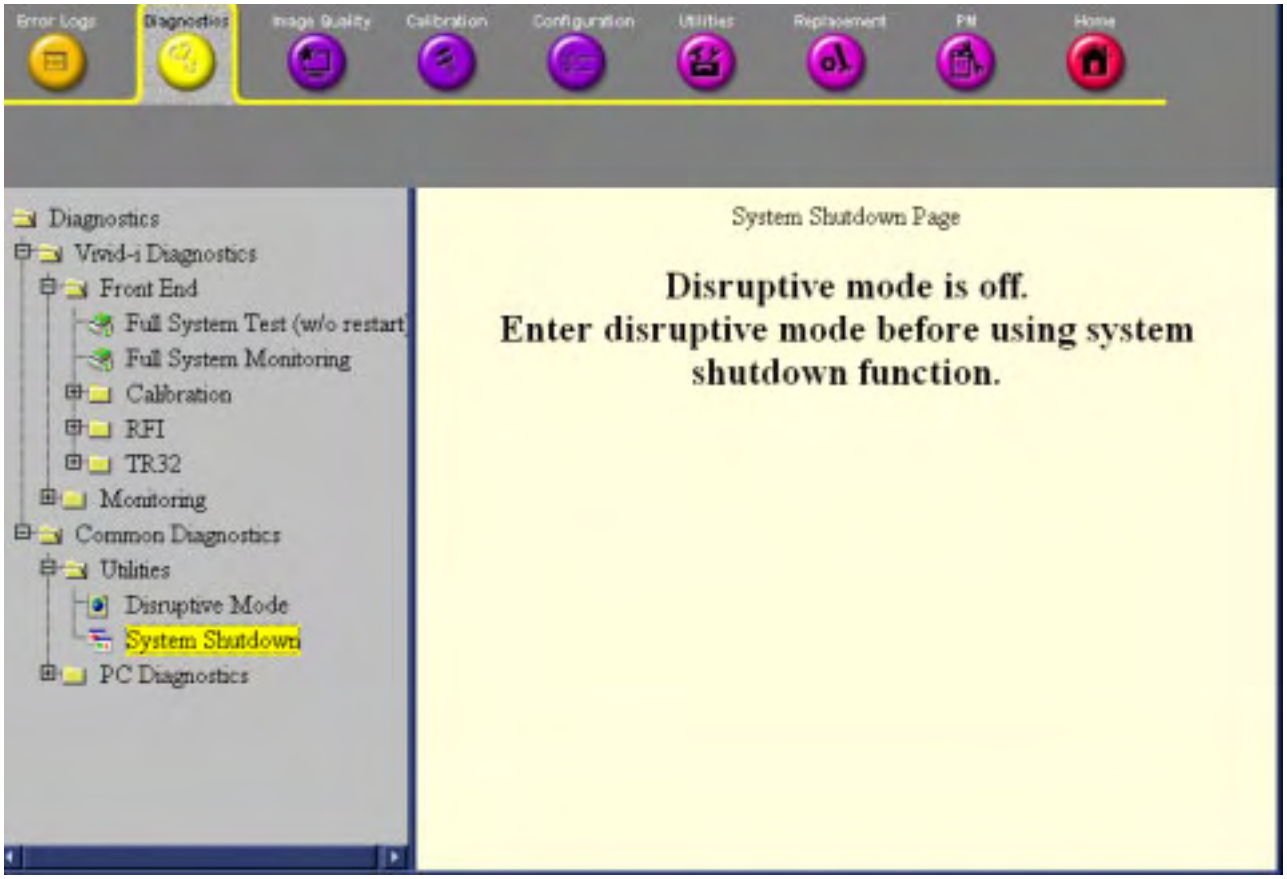


Figure 7-103 System Shutdown

7-7-4-3-2 PC Diagnostics

When the **PC Diagnostics** option is selected in the left pane of the *Diagnostics* page, the same tests as those performed by pressing **<Alt+Config>** during regular operation, can be conducted. Both *Non-interactive* (see Figure 7-104) and *Interactive* (see Figure 7-105) tests may be performed. However, the *Interactive* tests require the use of specific probes.

NOTE: To avoid failure alarms during the PC Diagnostics Tests, disconnect all probes that are not required to perform the test.

When **Non-Interactive Tests** are selected in the left pane of the *Diagnostics* page, the diagnostic tests described in the following sections can be performed:

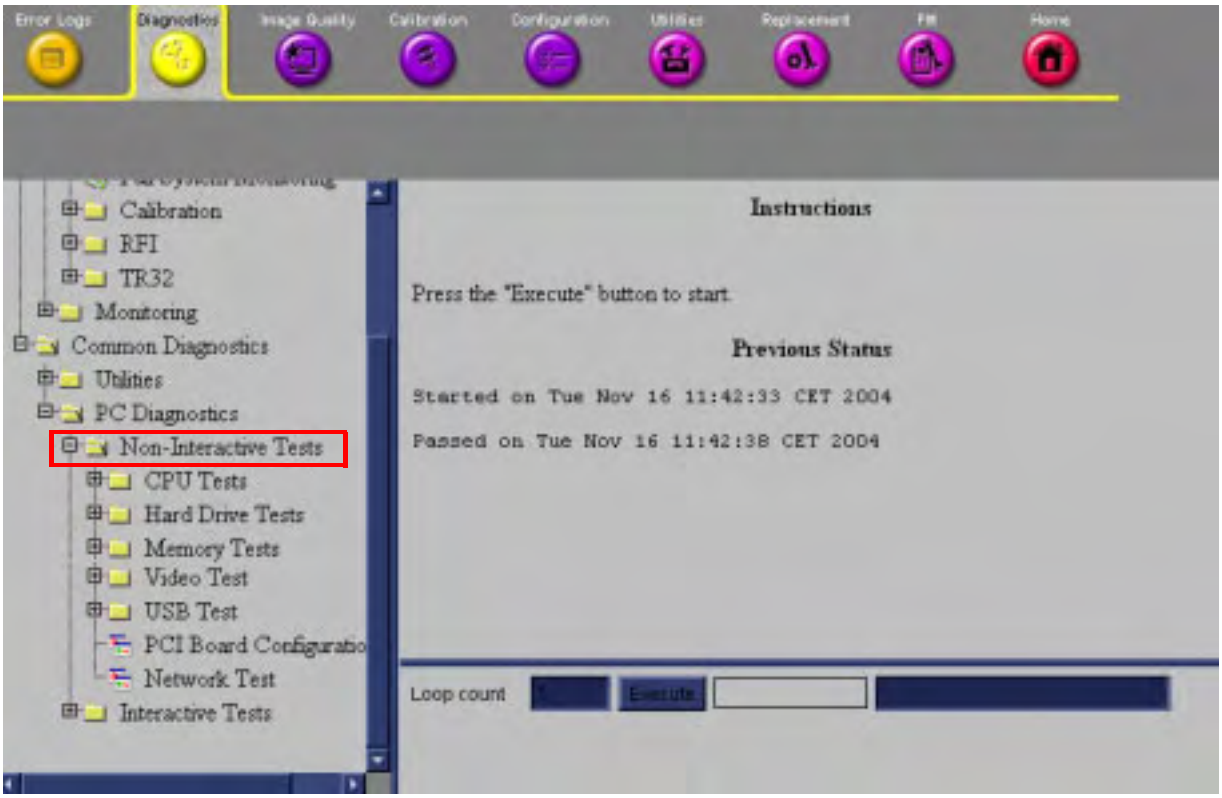


Figure 7-104 Non-Interactive Tests

For information on performing a specific Non-Interactive test, refer to the appropriate section, as follows:

- CPU Tests on page 7 - 143
- Hard Drive Tests on page 7 - 144
- Memory Tests on page 7 - 144
- Video Test on page 7 - 144
- PCI Board Configuration Test on page 7 - 145
- Network Test on page 7 - 145

CPU Tests

NOTE: For instructions on performing CPU Tests, refer to the CPU Tests section, page 7-114

When **PC Diagnostics** is selected in the left pane of the *Diagnostics* page, the following CPU diagnostic tests can be performed:

- **CPU Test (All):** Performs a battery of tests on your CPU to ensure that it is working properly. All the remaining tests are performed as part of the CPU Test.
- **CPU Registers:** Tests the CPU Registers using the default test patterns. On 32 bit CPUs, the extended registers are also checked. If errors are detected, the failed registers are listed.
- **CPU Arithmetics:** Tests the proper function of the arithmetic commands ADC, ADD, DEC, DIV, IDIV, IMUL, INC, MUL, SBB and SUB with 16 and 32 bit operands. If errors are detected, the failed commands and operands are listed.
- **CPU String Operations:** Tests the proper operation of the string commands LODS, MOVS, SCAS and STOS with 8, 16 and 32 bit operands. If errors are detected, the failed commands and operands are listed.
- **CPU Logical Operations:** Tests the proper operation of the logical operations AND, NOT, OR and XOR with 16 and 32 bit operands. If errors are detected, the failed operands are listed.
- **CPU Math Registers:** Tests the coprocessor register stack, pointers and commands FLDLZ, FLDPI, FLDLN2, FLDLG2M FLDL2T FLDL2E and FLD1. If errors are detected, the failed steps and commands are listed.
- **CPU Math Commands:** Tests the coprocessor commands FBLD/FBSTP, FLD/FST, FXCH, FCOM, FICOM, FTST, FXAM and FUCOM. If errors are detected, the failed instructions are listed.
- **CPU Transcendental:** Tests the coprocessor transcendental commands F2XM1, FPATAN, FPTAN, FYL2XP1, FCOS, FSIN and FSINCOS. If errors are detected, the failed commands are listed.
- **CPU MMX Arithmetic:** Tests the MXX commands PADD, PSUB, PMUL and PMADD. If errors are detected, the failed commands are listed.
- **CPU MMX Logical:** Tests the MXX commands PAND, PANDN, POR and PXOR. If errors are detected, the failed commands are listed.
- **CPU MMX Shift:** Tests the MXX commands PSLL and PSRL. If errors are detected, the failed commands are listed.
- **CPU MMX Data Transfer:** Tests the MXX commands MOVD and MOVQ. If errors are detected, the failed commands are listed.
- **CPU MMX Misc.:** Tests the MXX commands PCMPEQ, PCMPGT, PACKSS, PACKUS and PUNPCK. If errors are detected, the failed commands are listed.

Hard Drive Tests

When **PC Diagnostics** is selected in the left pane of the *Diagnostics* page, the following hard drive diagnostic tests can be performed:

- **Hard Drive Test (All):** Performs a battery of tests to examine the hard drive and ensure that it can perform all its functions. All the remaining tests are performed on the hard drive to ensure that the hard disk controller and the drive mechanism are working correctly. The disk surface itself is also checked. This test may take over ten minutes.
- **Hard Drive Linear Seek:** Moves the hard disk drive heads from track 0 to the maximum track one track at a time.
- **Hard Drive Funnel Seek:** Moves the hard disk drive heads in a funnel fashion (from the first track to the last, then to the second track, the second last track, the third track and so on).
- **Hard Drive Surface Scan:** Scans the surface for defects on the hard disk drive.

NOTE: For instructions on performing Hard Drive Tests, refer to the HD Test section, page 7-117*.*

Memory Tests

When **PC Diagnostics** is selected in the left pane of the *Diagnostics* page, the following memory diagnostic tests can be performed:

- **Memory Test (All):** Uses 18 test patterns to test memory locations. If errors are detected, the address of the block in which the error was detected is shown. During testing, these diagnostics will also look for parity errors and other exceptions. If encountered, these are added to the test log as errors.
- **Memory Pattern Test:** Uses several test patterns to test as much memory as possible.
- **Memory Parity Test:** Checks for parity errors on the memory bus during intensive string transfer operation. If an error is detected, the address of the failed block is displayed.

NOTE: For instructions on performing Memory Tests, refer to the Memory Test section, page 7-119*.*

Video Test

When **PC Diagnostics** is selected in the left pane of the *Diagnostics* page, the following video diagnostic tests can be performed. These tests use 18 test patterns to fill the video buffer, testing your graphics acceleration and text output

- **Video Test (All):** Test the system's video capabilities. This involves testing the memory, testing the graphics acceleration and testing the text output. You can follow the tests being performed on the monitor. This test can be cancelled at any time by pressing <**Esc>** on the keyboard.
- **Video Memory:** Tests the video memory by filling the video buffer with 18 test patterns, one pattern at a time. These tests fill the entire screen with a single color.
- **Video Data Transfer:** Tests the graphics acceleration part of the video controller. This test fills the screen with black and white concentric squares, and rectangles of various sizes and colors. If errors are detected, the locations of the problems are displayed.
- **Video Text Output:** Prints a text string in random sizes and colors to test the video device driver and video controller.

NOTE: For instructions on performing Video Tests, refer to the Video Test section, page 7-121*.*

PCI Board Configuration Test

A Peripheral Component Interconnect (PCI) bus is a fast standard bus that is common in Pentium systems. When **PC Diagnostics** is selected in the left pane of the *Diagnostics* page, PCI diagnostic tests can be performed to ensure that the PCI bus is working up to speed. The motherboard is scanned to verify the configuration space and to ensure that the diagnostics can communicate with the board.

NOTE: For instructions on performing the PCI Board Configuration Test, refer to the PCI Test section, page 7-123*.*

Network Test

A Network Interface Card (NIC) is a computer circuit board or card that is installed in a computer so that it can be connected to a network. Networks are used by businesses and some home users to connect PCs together so that they can share files and resources. Data travels over a network connection much faster than over standard internet connections.

The PC Doctor Network Test will reveal that a network card is present without a driver installed. These cards are likely to not show up on a PC's list of network cards available for test. This may cause the test to return a result of "not applicable", meaning no network cards were found. The test may detect other issues such as electrical interference (noise), circuitry damage, loose connectors, and crimped or bad network cables.

The Network Test will test DSL or cable internet connections, which operate within a network environment. However, this test does not test the DSL or cable modem used for accessing the Internet. Currently, no PC-Doctor test exists for testing cable or DSL modems.

The Network Communications Test checks if your PC's network card works and if your PC properly communicates over a network. It makes a list of all the remote PCs on the network that the NIC uses and sends information in the form of several "data packets" from the tested PC to the "host" PCs. These "data packets" are then returned by the "host" PCs to the tested PC where the contents of the "data packet" are checked. If too many of the "data packets" fail to get returned or are thrown away because of data corruption, the Network test logs as FAILED.

NOTE: For instructions on performing the Network Test, refer to the Network Test section, page 7-125*.*

When **Interactive Tests** are selected in the left pane of the *Diagnostics* page, the diagnostic tests described in the following sections can be performed:

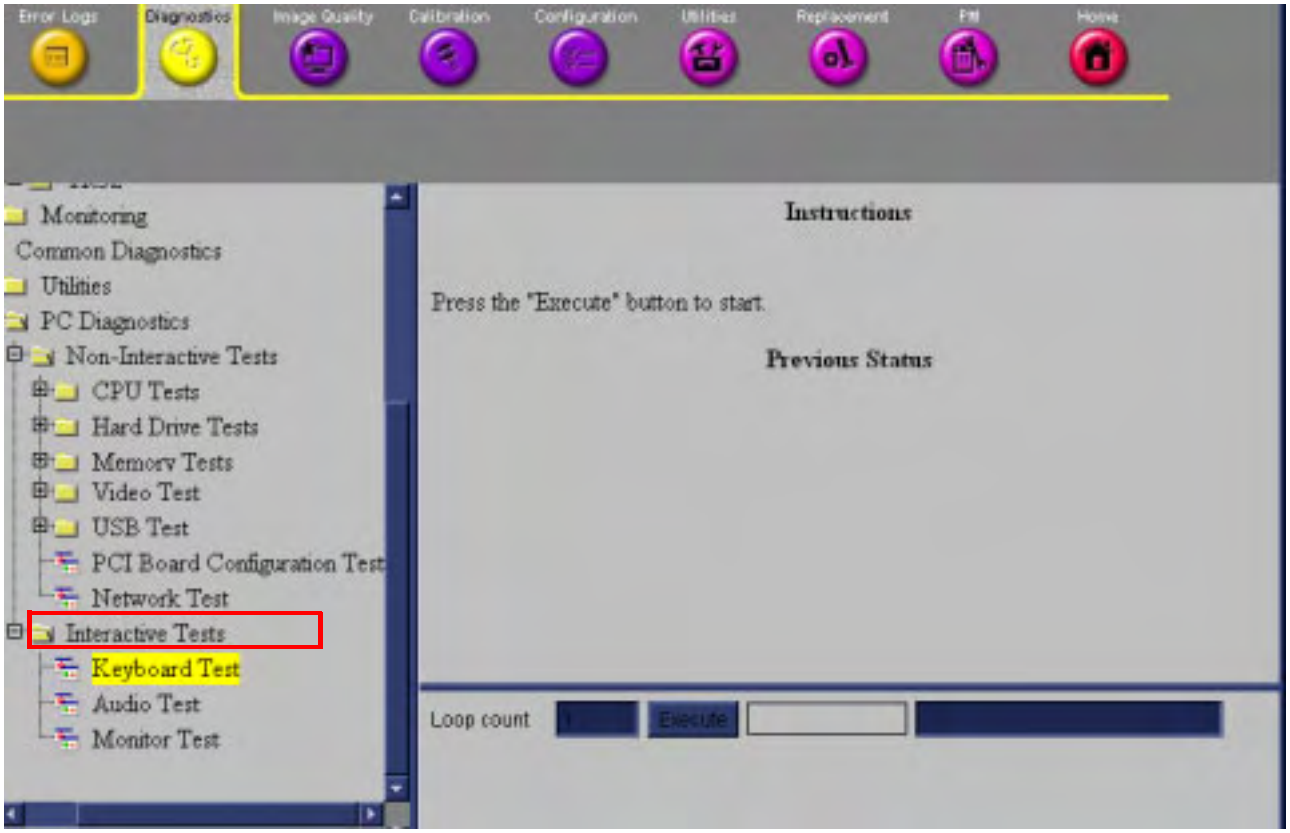


Figure 7-105 Interactive Tests

NOTE: Interactive tests are performed on the Front Board only.

For information on performing a specific Interactive test, refer to the appropriate section, as follows:

- Keyboard Test on page 7 - 147
- Audio Test on page 7 - 147
- Monitor Test on page 7 - 148

Keyboard Test

When **PC Diagnostics** is selected in the left pane of the *Diagnostics* page, the keyboard diagnostic tests can be performed. After selecting your keyboard type from the drop-down list, click the **Test** button. The *PCDR Keyboard Test* window is displayed, showing all the keyboard keys. Press each key on the keyboard once and ensure that the corresponding keys on-screen are removed from view. If a key is not removed, that key may be damaged and need to be replaced or repaired. Click the **Reset** button to reset the keyboard, or click the **Close** button to exit the test.

PCDR Keyboard Test
Instructions
This test allows you to check the keys on your keyboard.
When you press a key, the corresponding key onscreen is removed if the key is functioning properly.
You can reset the onscreen keyboard at any time by pressing ALT + R.
Reset Keys
Close

Figure 7-106 PCDR Keyboard Test Window

Audio Test

The Audio Test is performed to check for proper operation of the audio system; the following selections are available: *Left Channel*, *Right Channel*, *Both Channels,* and *MIDI*.

NOTE: For instructions on performing the Audio Test, refer to the Audio Test section, page 7-147*.*

Monitor Test

When **PC Diagnostics** is selected in the left pane of the *Diagnostics* page, the following monitor diagnostic tests can be performed, as shown below:

Monitor Test
Instructions
This test has three elements. Select the one that you want to use. When you are in a test screen, hit any key or the left mouse button to return to this dialog. Hit "Close" to quit.
The combination test helps check your monitor for alignment, color depth and monitor resolution. It will put four crosshairs in each corner, RGB spectrum arrays and horizontal and vertical alignment bars on the screen.
The Solid Color Test is intended for LCD displays, to make sure that all LCD color pixels are working correctly.
The VESA Test Patterns allow you to test the display for Luminance, Geometry and Focus. These tests are intended for professional measurement use.
Combination Test
Combination
Solid Color Test (LCD Pixel Test)
Red
Green
Blue
VESA Test Patterns
Luminance
Geometry
Focus
Close

Figure 7-107 Monitor Test

- **Combination Test:** Checks the monitor alignment, color depth and monitor resolution. Four cross hairs are placed in each corner of the screen, as well as RGB spectrum arrays and horizontal and vertical alignment bars.
- **Solid Color Test:** Tests the panel display on laptops and LCD screens. This test display a solid color on the screen to ensure that all the color pixels are operating correctly.
- **VESA (Video Electronics Standards Association) Test Patterns:** Checks luminance, geometry and focus. These tests are designed for professional measurement use.

NOTE: For instructions on performing the Monitors Test, refer to the Logs section, page 7-132.

7-7-5 Image Quality Page

When the *Image Quality* page is selected, as shown below, you can verify and calibrate image quality.

Figure 7-108 Image Quality Page

Note: This page is not populated in this version.

7-7-6 Calibration Page

update with and link to our test

When the *Calibration* page is selected, as shown below, you can perform different calibration procedures, as described in *Chapter 6 - Service Adjustments*.

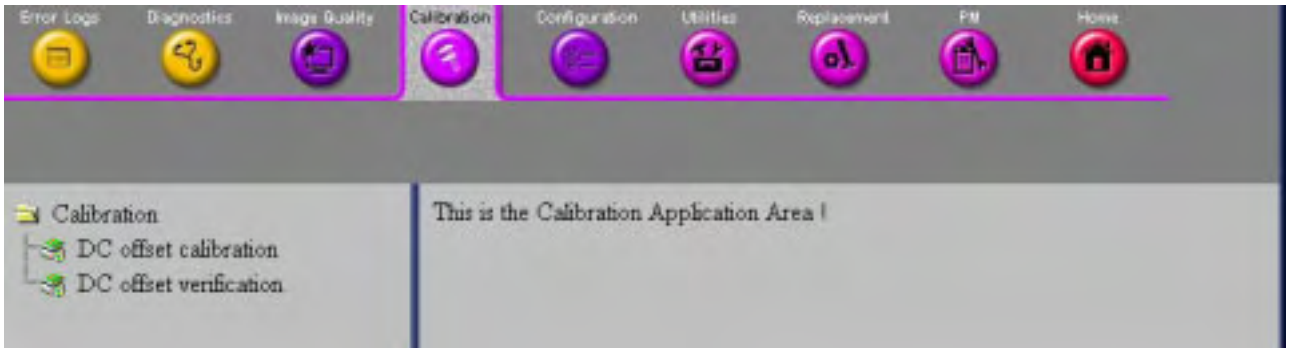


Figure 7-109 Calibration Page

For information on performing a specific Calibration test, refer to the appropriate section, as follows:

- DC Offset Calibration - see DC Offset Calibration on page 7 - 24.
- DC Offset Verification- see DC Offset Verification on page 7 - 27.

7-7-7 Configuration Page

When the *Configuration* page is selected, you can access the **Software Options Interface** and install software options for the specific Vivid-i™ system.

No changes should be made in this page without the help of GE Medical Systems Service Personnel, as any modifications made by untrained personnel can cause damage to the ultrasound unit.

.

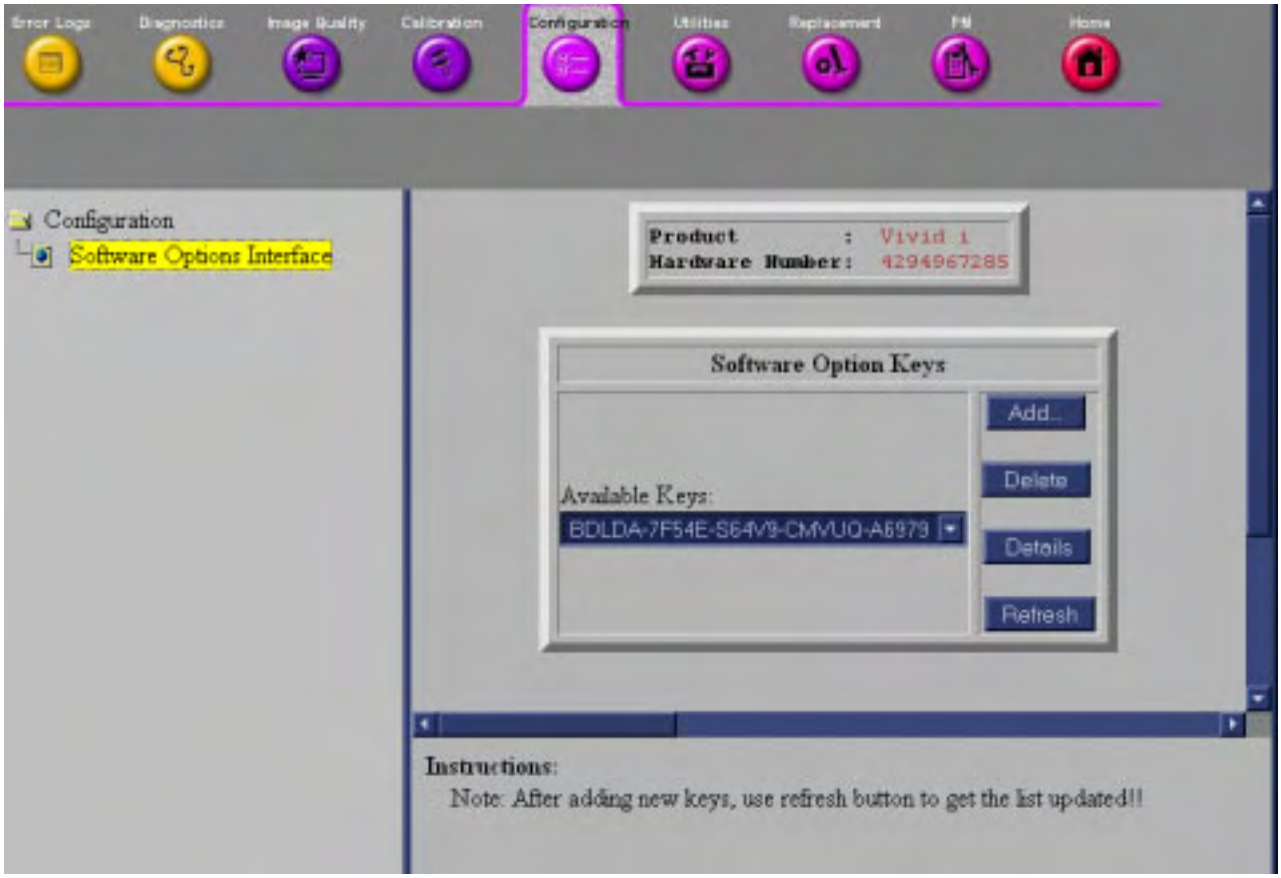


Figure 7-110 Configuration Page

7-7-8 Utilities Page

When the *Utilities* page is selected (as shown below), a variety of Windows 2000 utility tools are available to indicate the status of the system, in addition to various other tools.

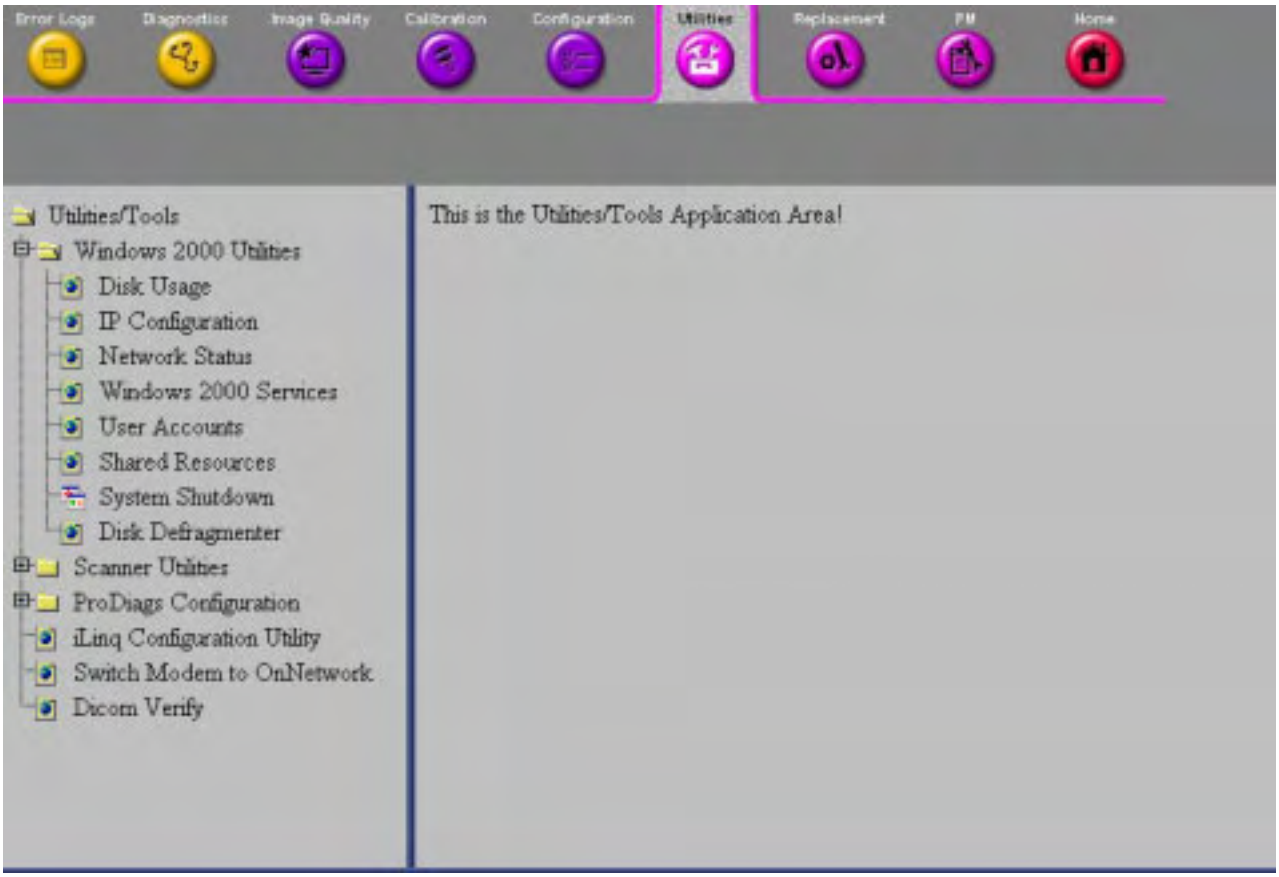


Figure 7-111 Utilities Page

7-7-8-1 Windows 2000 Utility

The information accessed under *Windows 2000 Utilities* are:

- **Disk Usage** - shows the amount of hard disk space available, and the size already utilized.
- **IP Configuration** - shows the IP configuration of the different remote devices - such as, the network or the modem.
- **Network Status** - shows the communication status of active connections on the network.
- **Windows 2000 Services** - shows which services (applications) are currently active on Windows 2000.
- **User Accounts** - shows the internal account information that was provided and set up on the system by the OLC.
- **Shared Resources** - indicates the resources being shared by the system.
- **System Shutdown** - There are three options provided (see Figure 7-112):
  - Restart System - restart the application
  - Shutdown System - total shutdown of the system
  - Retain Disruptive Mode - request to perform diagnostics remotely
- **Disk Defragmenter** - idefragments the Hard Disk.

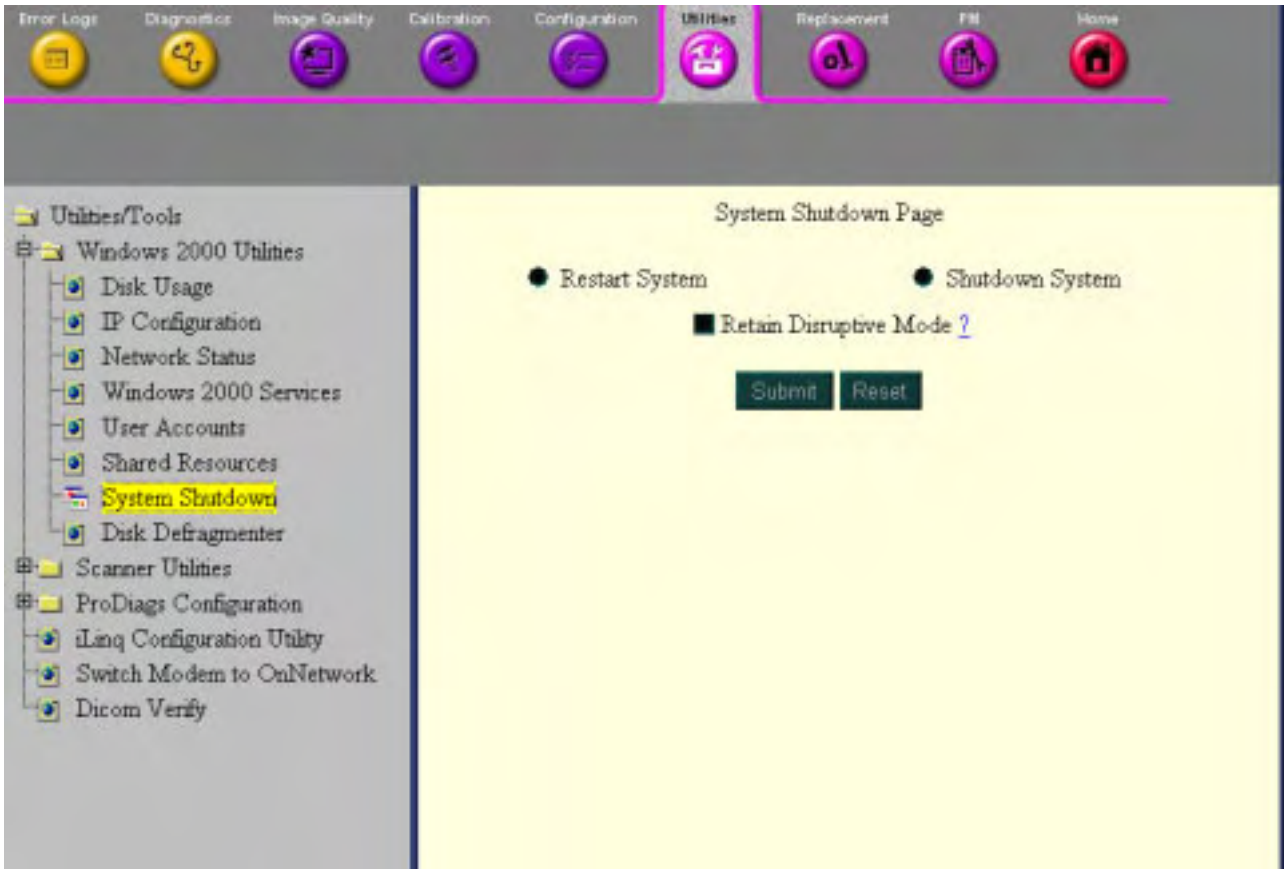


Figure 7-112 System Shutdown

7-7-8-2 Scanner Utilities

The functions accessed under *Scanner Utilities* are described below.

- **Disruptive Mode** - Previously described - see page 7 - 140
- **System Shutdown** - There are three options provided (described previously - also see Figure 7-112)
- **Set Debug Utility** - used to set debugging variables and values - see below:

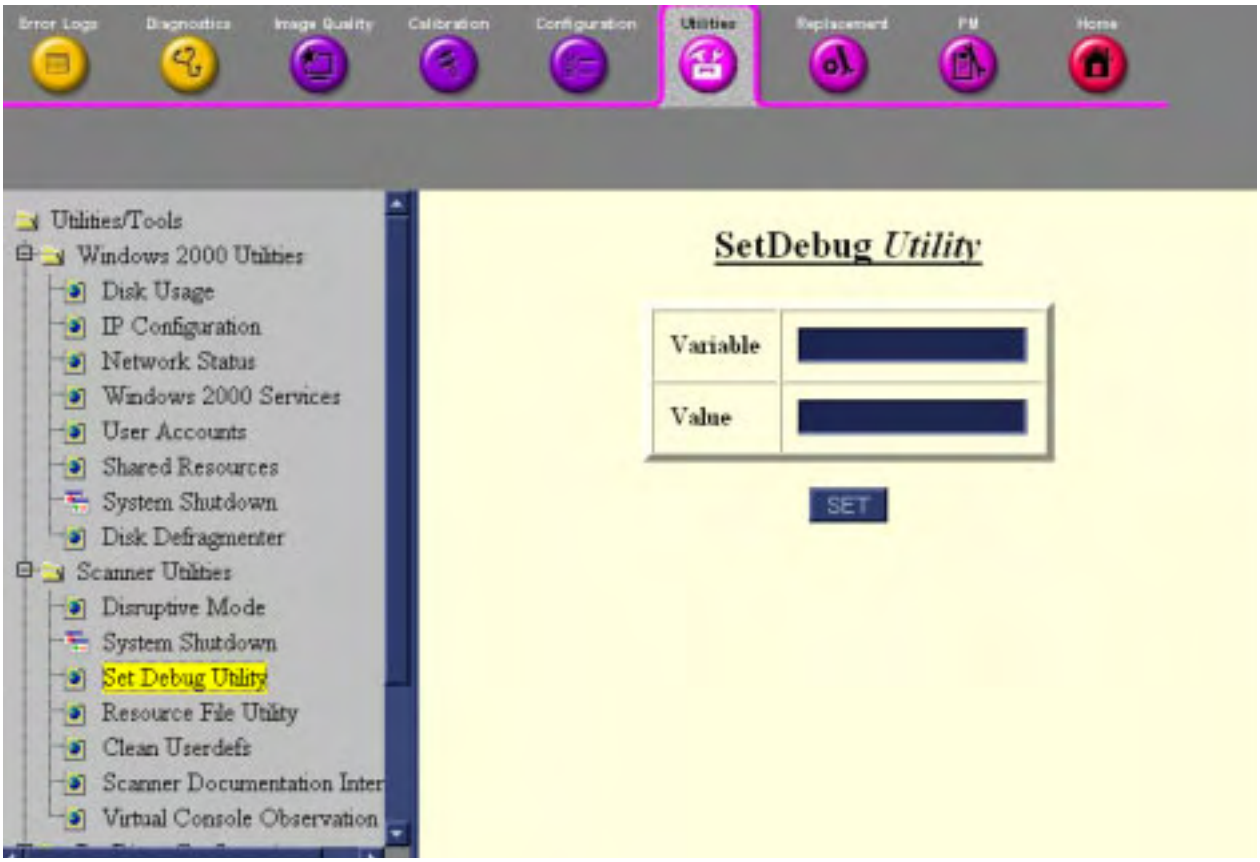


Figure 7-113 Set Debug Utility

- **Resource File Utility** - provides access to user-defined resource files:

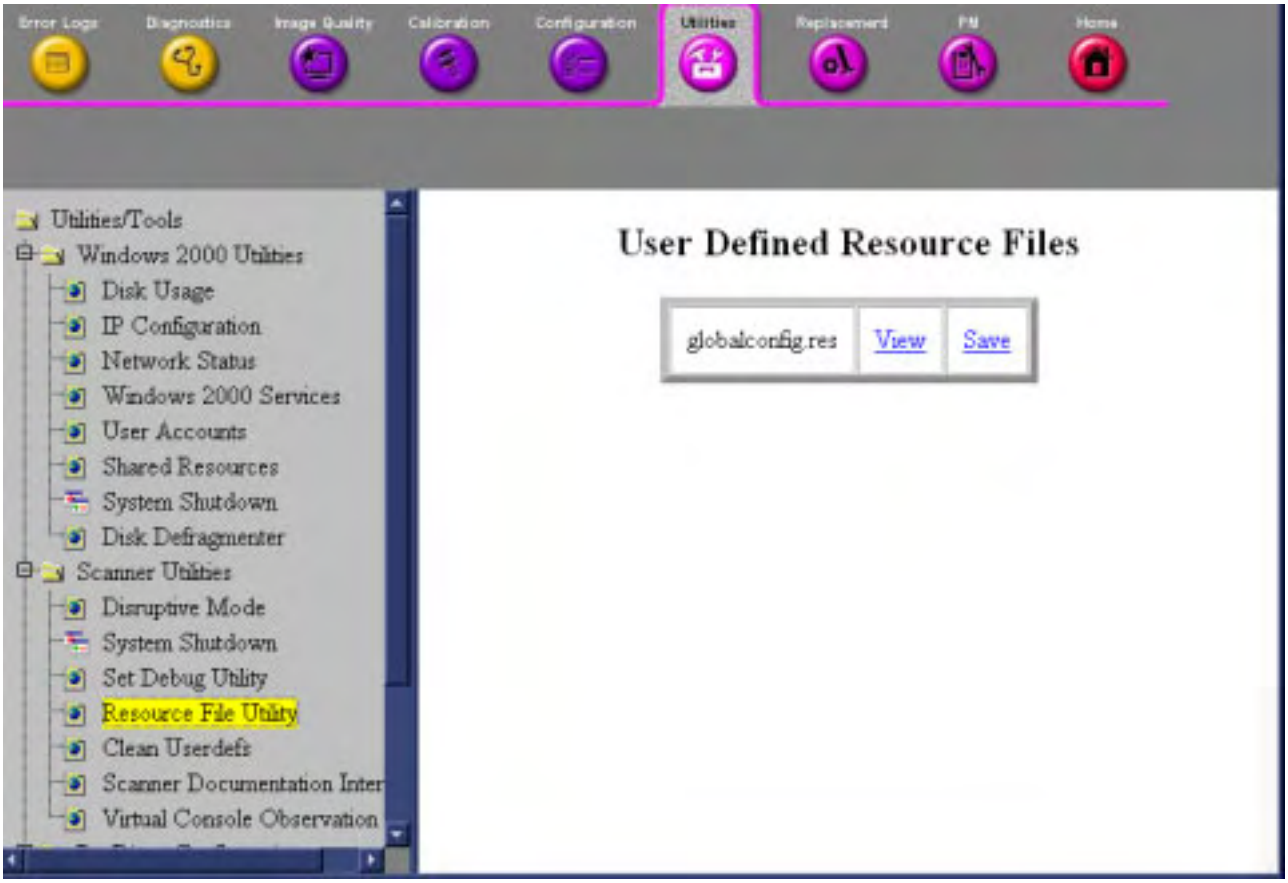


Figure 7-114 Resource File Utility

- **Clean UserDefs** - used to clean all user-defined settings and restore the default settings

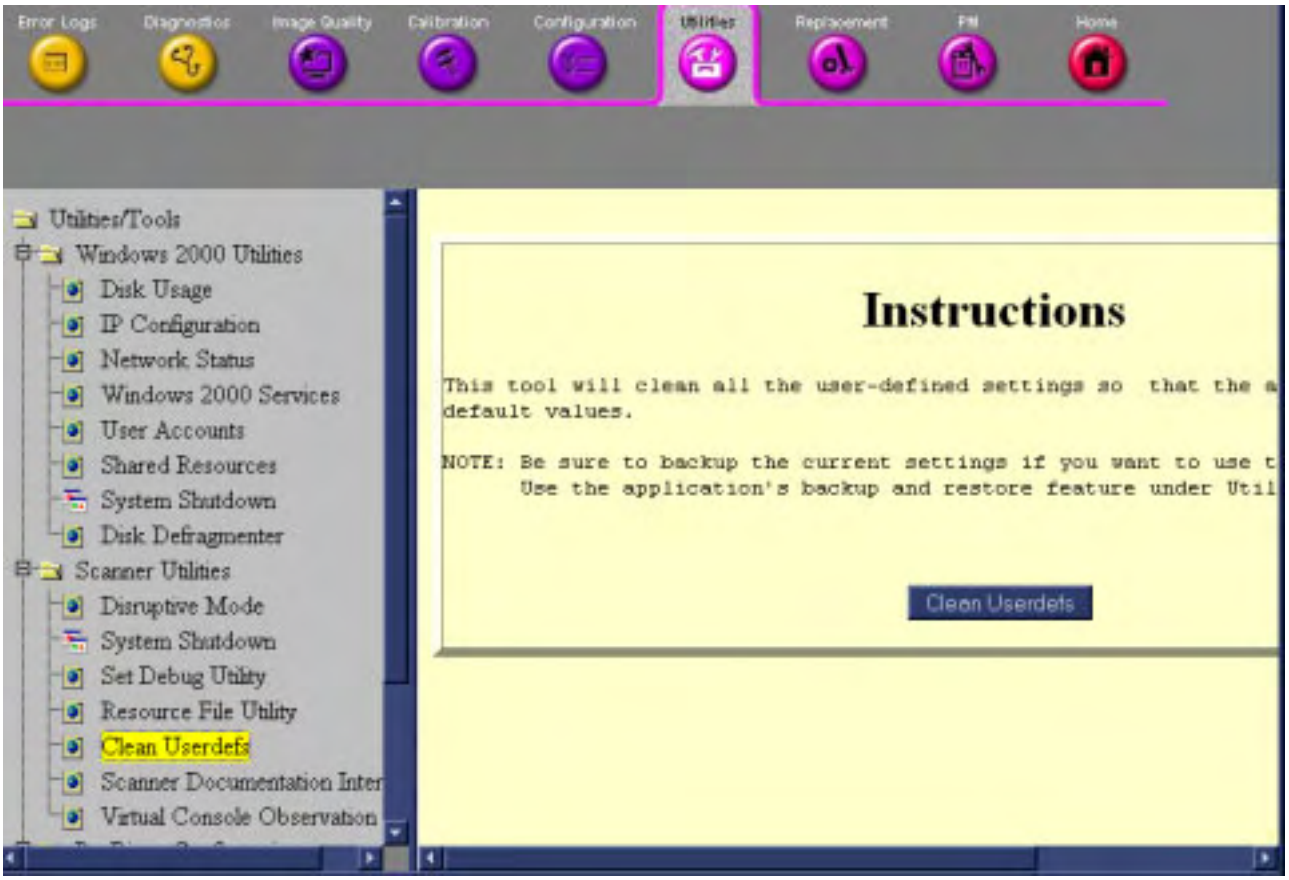


Figure 7-115 Clear User-defined Settings

CAUTION: ***THIS PROCESS IS IRREVERSIBLE! Before proceeding, make sure you have a complete backup of the current settings if they will be required in the future***.

When selecting **Clean Userdefs**, the following warning message is displayed:

3.249.85.53 - [JavaScript Application]
Warning: All current user defined settings will be cleaned.
Use the application's backup and restore feature to save the current copy
Ok -- Proceed
Cancel -- Stop
OK
Cancel

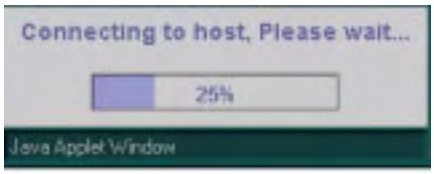
After making a back-up copy of the current settings, click **OK** to proceed.

NOTE: This function performs the same procedure as that of Restore Factory Presets (accessed under the System Configuration window - System tab).

7-7-8-3 ProDiags Configuration

7-7-8-3-1 ProDiags Browser

1) Select the **Prodiags Browser** under the **Configuration Utility** option. The following message is displayed.



Wait a few minutes, until the following screen is displayed.

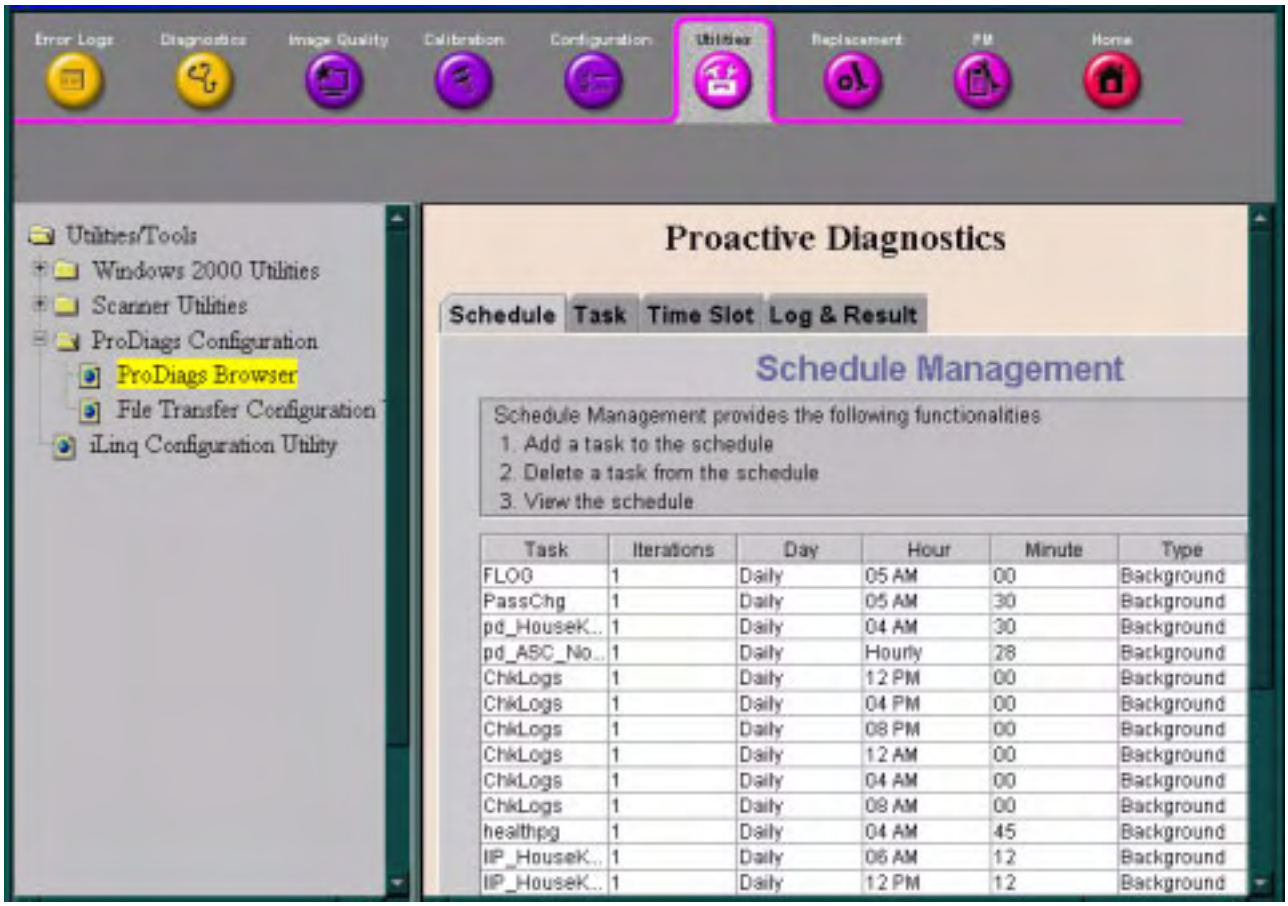

Error Logs
Diagnostics
Image Quality
Calibration
Configuration
Utilities
Replacement
PM
Home
Utilities/Tools
Windows 2000 Utilities
Scanner Utilities
ProDiags Configuration
ProDiags Browser
File Transfer Configuration
iLinq Configuration Utility
Proactive Diagnostics
Schedule
Task
Time Slot
Log & Result
Schedule Management
Schedule Management provides the following functionalities
1. Add a task to the schedule
2. Delete a task from the schedule
3. View the schedule
Task | Iterations | Day | Hour | Minute | Type
FLOG | 1 | Daily | 05 AM | 00 | Background
PassChg | 1 | Daily | 05 AM | 30 | Background
pd_HouseK... | 1 | Daily | 04 AM | 30 | Background
pd_ASC_No... | 1 | Daily | Hourly | 28 | Background
ChkLogs | 1 | Daily | 12 PM | 00 | Background
ChkLogs | 1 | Daily | 04 PM | 00 | Background
ChkLogs | 1 | Daily | 08 PM | 00 | Background
ChkLogs | 1 | Daily | 12 AM | 00 | Background
ChkLogs | 1 | Daily | 04 AM | 00 | Background
ChkLogs | 1 | Daily | 08 AM | 00 | Background
healthpg | 1 | Daily | 04 AM | 45 | Background
IP_HouseK... | 1 | Daily | 06 AM | 12 | Background
IP_HouseK... | 1 | Daily | 12 PM | 12 | Background

Figure 7-116 ProDiags Browser - Schedule

The **Schedule** tab indicates the tasks that are scheduled, and on which date they are scheduled, and their frequency. It also indicates the type of operation - *Background* or *Foreground*.

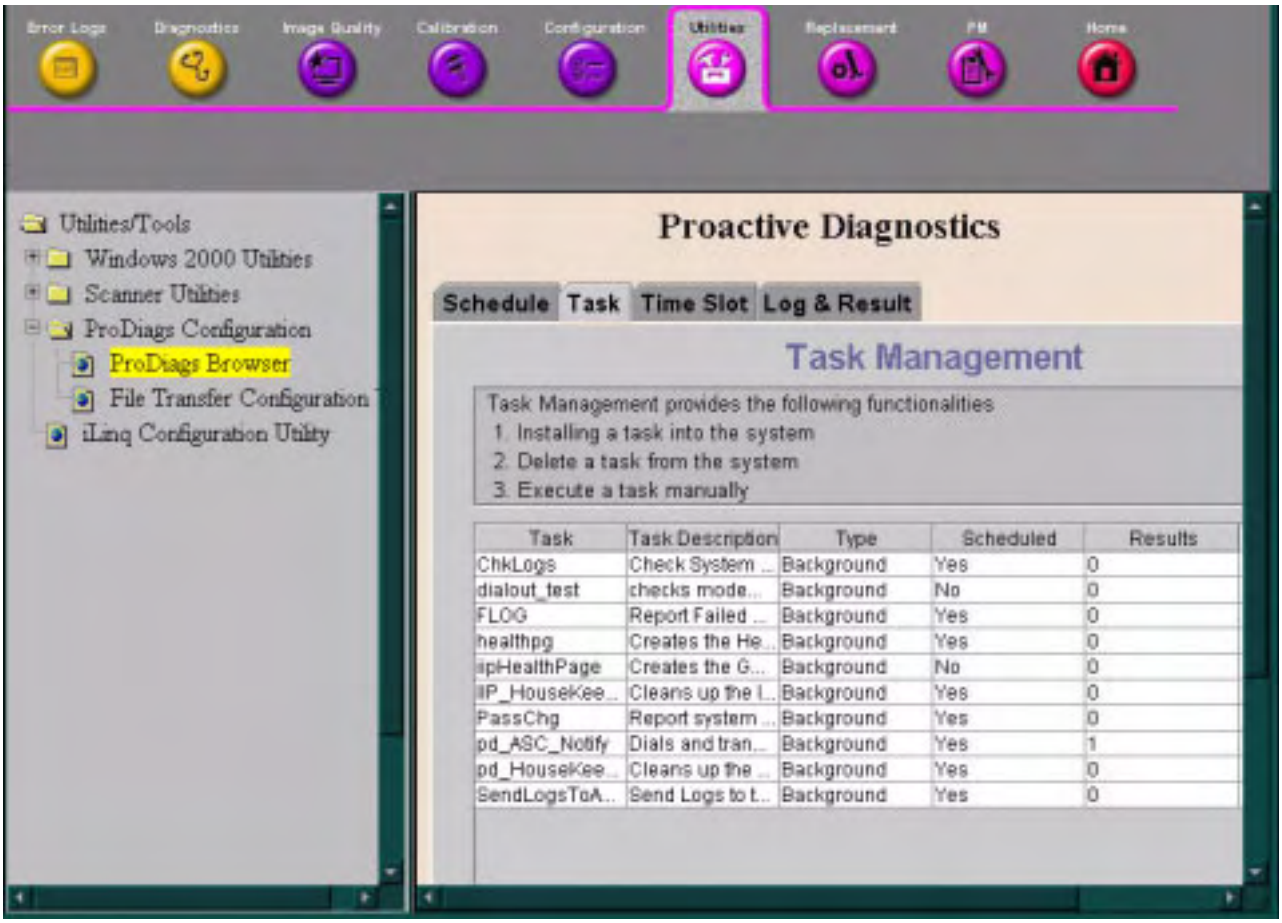


Figure 7-117 ProDiags Browser - Task

The **Task** tab indicates all the tasks that are available for activation. This also indicates which tasks are scheduled, and their type.

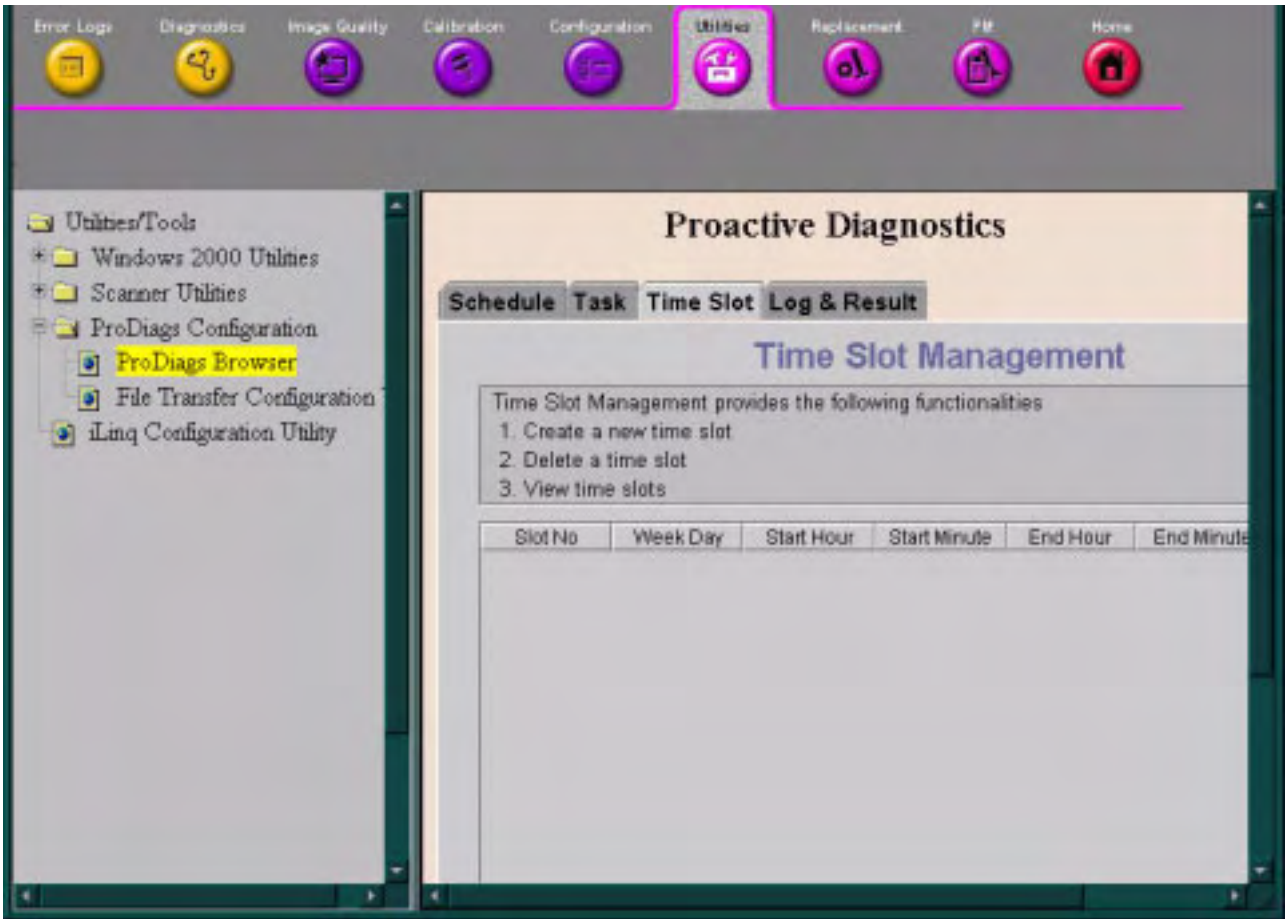


Figure 7-118 ProDiags Browser - Time Slot

The **Time Slot** tab indicates the time slots available for setting tasks.

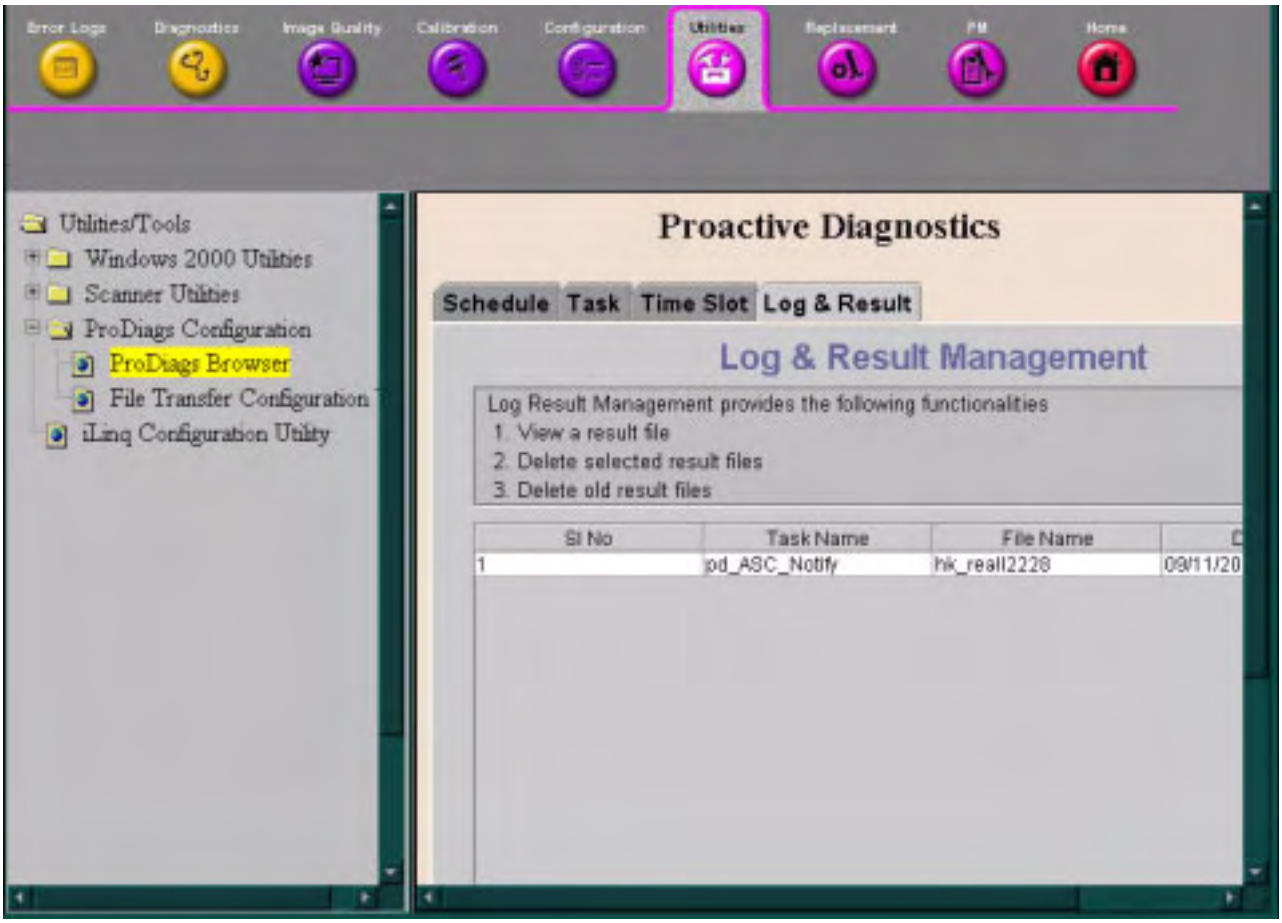


Figure 7-119 ProDiags Browser - Log and Result

The **Log & Result** tab indicates the logs and results of any tasks that have been performed.

At any of the above-mentioned tabs, you can *Add* or *Delete* a task from the list of displayed tasks.

7-7-8-3-2 File Transfer Configuration

The **File Transfer Configuration** utility can be used to transfer files to the GE Service center. Follow the on-screen instructions as shown below.

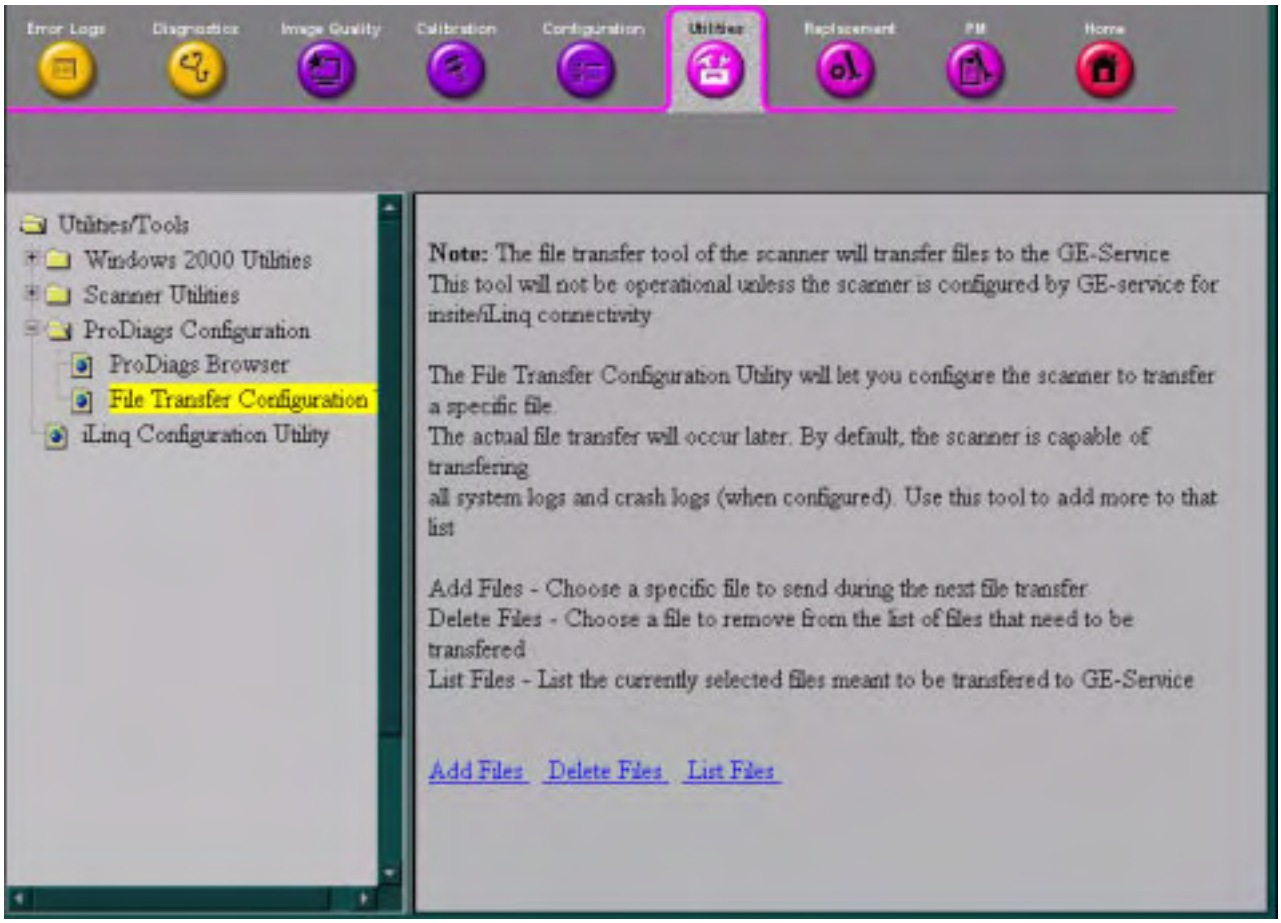

Error Logs
Diagnostics
Image Quality
Calibration
Configuration
Utilities
Replacement
PM
Home
Utilities/Tools
Windows 2000 Utilities
Scanner Utilities
ProDiags Configuration
ProDiags Browser
File Transfer Configuration
iLinq Configuration Utility
Note: The file transfer tool of the scanner will transfer files to the GE-Service
This tool will not be operational unless the scanner is configured by GE-service for insite/iLinq connectivity
The File Transfer Configuration Utility will let you configure the scanner to transfer a specific file
The actual file transfer will occur later. By default, the scanner is capable of transfering
all system logs and crash logs (when configured). Use this tool to add more to that list
Add Files - Choose a specific file to send during the next file transfer
Delete Files - Choose a file to remove from the list of files that need to be transfered
List Files - List the currently selected files meant to be transfered to GE-Service
Add Files
Delete Files
List Files

Figure 7-120 File Transfer Configuration

7-7-8-3-3 iLinq Configuration Utility

When the **iLinq Configuration Utility** option is selected in the left pane of the Configuration page (see Figure 7-121 below) - the *InSite Interactive Platform Configuration* window is displayed, as shown in Figure 7-122 on page 7-162.

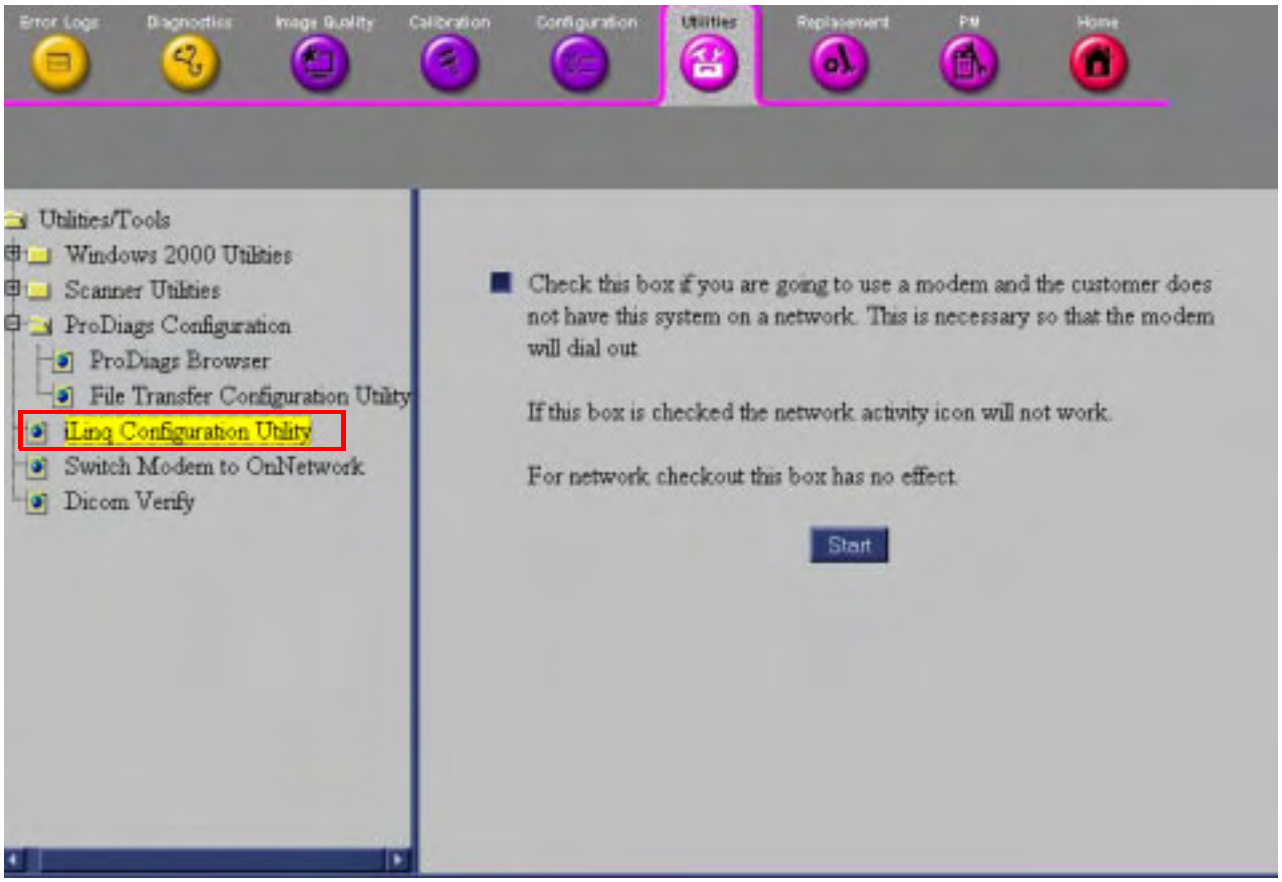

Error Logs
Diagnostics
Image Quality
Calibration
Configuration
Utilities
Replacement
PM
Home
Utilities/Tools
Windows 2000 Utilities
Scanner Utilities
ProDiags Configuration
ProDiags Browser
File Transfer Configuration Utility
iLinq Configuration Utility
Switch Modem to OnNetwork
Dicom Verify
Check this box if you are going to use a modem and the customer does not have this system on a network. This is necessary so that the modem will dial out.
If this box is checked the network activity icon will not work.
For network checkout this box has no effect.
Start

Figure 7-121 iLinq Configuration Utility

Click **Accept** and select the modem device as the communication device to the OLC in the **Device Connection** tab, also shown below.

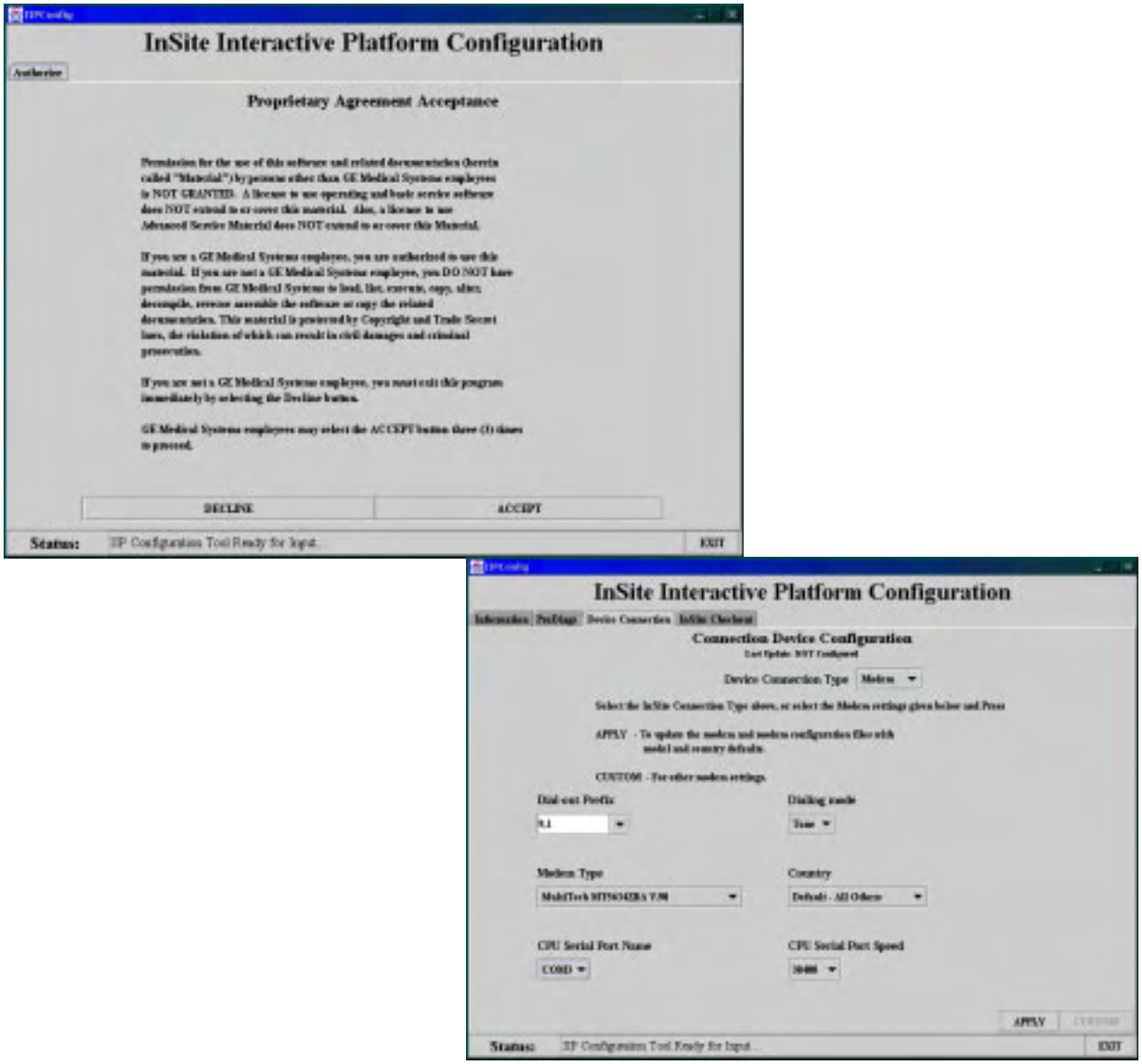


Figure 7-122 InSite Interactive Platform Configuration

Contact the OLC to receive all the setup information required for the **InSite Checkout** tab, as shown below. When all the settings have been entered, click the **CHECKOUT NOW** button twice. The OLC will attempt to communicate with your ultrasound unit via the modem. The unit should be connected to a direct telephone line, so that the OLC can dial in directly to the scanner.

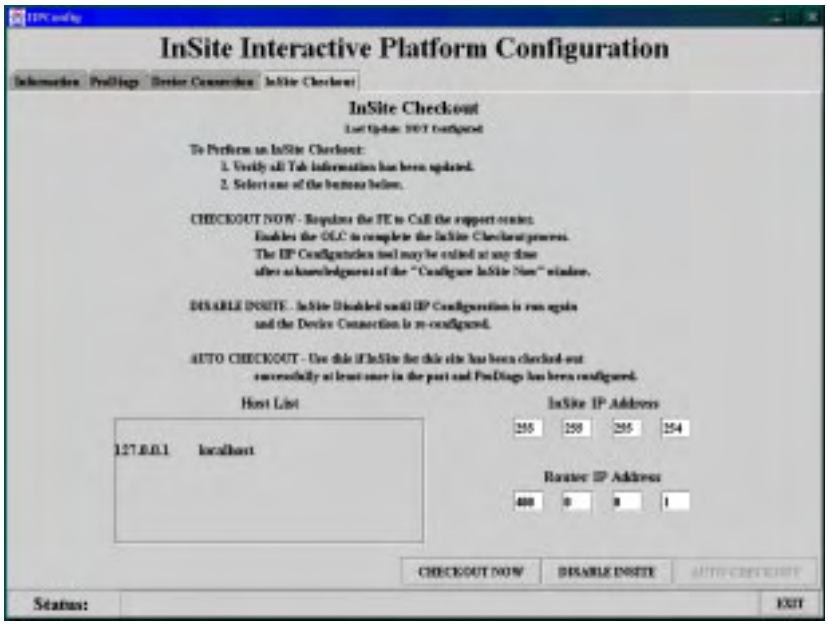


Figure 7-123 InSite Checkout Tab

7-7-9 Replacement Page

When the *Replacement* page is selected, as shown below, part replacement details and ordering information is displayed, as described in *Chapter 9 - Renewal Parts*.

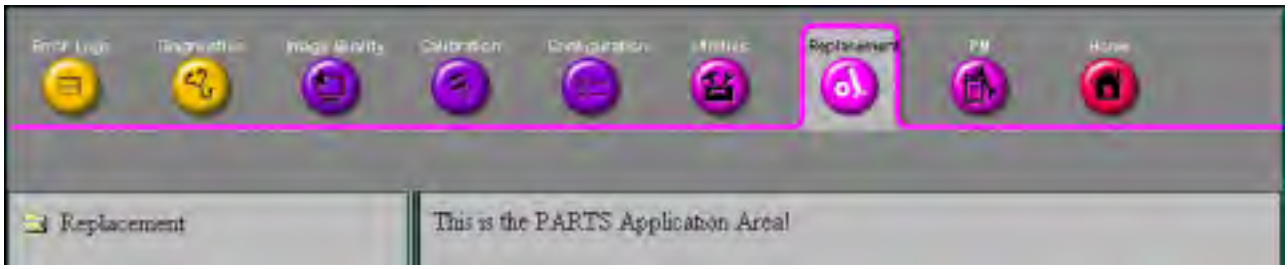


Figure 7-124 Replacement Page

Note: This page is not populated in this version.

7-7-10 PM Page

When the *PM* page is selected, as shown below, information about planned, proactive and preventive maintenance is displayed, as described in *Chapter 10 - Care and Maintenance*.

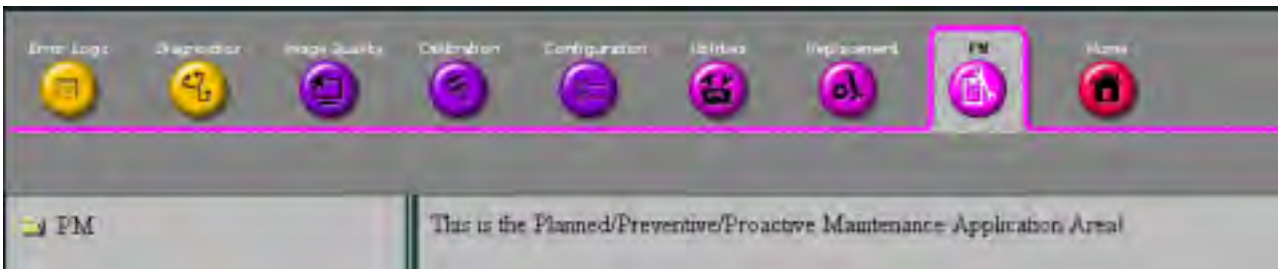


Figure 7-125 PM Page

Note: This page is not populated in this version.

Section 7-8
Automatic Error Log

The Vivid-i™ automatically logs the software activity, sequences and error messages that occur during normal operation. Each day's activity is compressed into a single daily logger report, with a time stamp appearing in each line of the report. Additional user comments and screen captures, can also be included in the report. Each day's report is saved in the system for 90 days, during which time they can be recalled and saved to disk.

7-8-1 Adding Bookmarks

One of the new features added in version BT06 is the ability to add bookmarks. When a problem occurs during regular use of the system, simply press **< Alt+B >**. This action will insert a "bookmark" into the system failure logs. The message *Log is Bookmarked* will be displayed on the prompt line, as shown in the example in Figure 7-126.

Figure 7-126 Message Showing Bookmark Added to Log

The bookmark will allow users to place a time-stamp where a particular problem has occurred, while continuing with their current activity with minimum interruption.

Note: The log file bookmark will later make it easy for service engineers to locate the location of the failure logging more precisely.

7-8-2 Extracting Logs

Whenever log extraction is necessary due to the occurrence of an error that needs to be reported, or any other reason, follow the instructions below:

1.) While the system is turned-ON in any mode, press **<ALT + D>** on the alphanumeric keyboard.

The System Problem Reporting dialog opens - see Figure 7-127 on page 7-166.

2.) In the *Description of Issue* window, type a description of the problem.

Notes should be made regarding the selected probe, the imaging mode and the application that was being used at the time of the malfunction.

If applicable, try to describe the button or key-pushing sequence that immediately preceded the problem.

If applicable, activate the System Lockup checkbox.

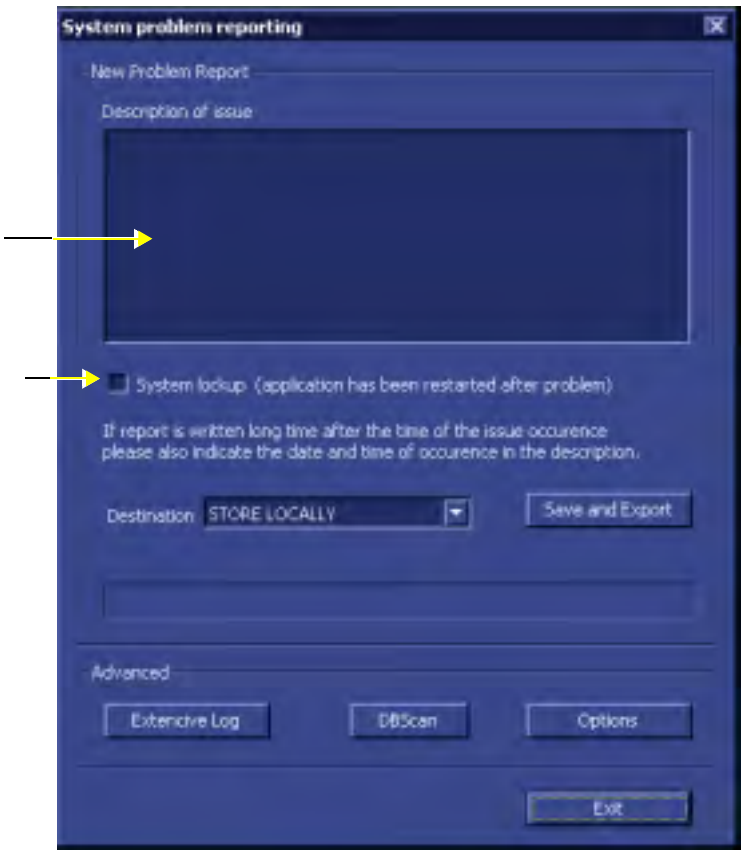


Figure 7-127 System Problem Reporting Dialog

3.) If use of the Advanced features is required, proceed to the following instructions, as applicable:

- Enabling Extensive Logging on page 7 - 168
- Advanced Options on page 7 - 170
- DB Scan on page 7 - 173

After the required advanced features have been selected, continue with step 4 and step 5, below.

4.) From the *Destination* drop-down menu, select the required export destination (CD or Memory Stick) then click **Save and Export**.

A Zip file (named "logfile_<date>_<time>.zip") is copied onto the selected removable media.

Note: Previously, users were required to save log files before exporting them. With version BT06, these two operations are performed as one step.

IMPORTANT When selecting CD as the export destination, first make sure that the CD has been formatted. For details, see Formatting a CD on page 7 - 167.

5.) When done, click the **Exit** button.

The System Problem Reporting dialog closes.

6.) Press **<Ctrl>+E** to eject the media.

7-8-2-1 Formatting a CD

Prior to exporting logs or any data onto a CD, this media must be formatted, as described below.

To Format a CD:

1.) Connect the DVD/CD-RW media drive to the USB port and make sure the DVD/CD-RW power switch on the rear of the drive is set in the **External** position, as shown in Figure 7-128, below.

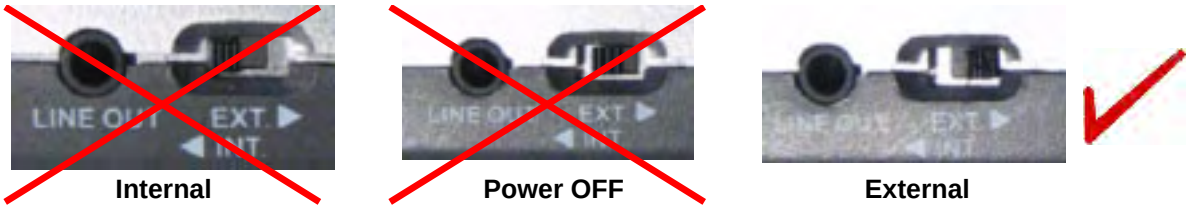


Figure 7-128 Power Switch in External Position

2.) Insert the blank CD media into the DVD/CD-RW drive tray.

3.) On the Vivid-i™ system, press the **<Config>** key.

4.) Select the **Connectivity** Tab and activate the **Tools** Tab.

5.) Under *Removable Media*, select the media type **CD** from the Media drop-down menu, as shown in Figure 7-129.

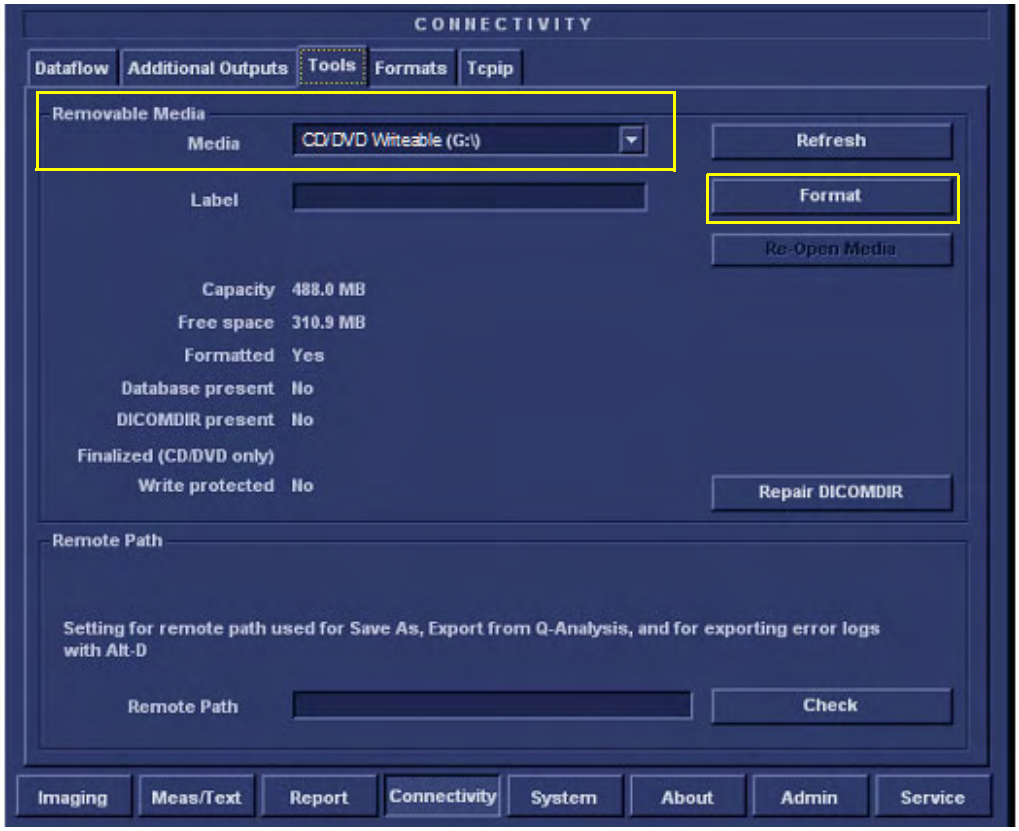


Figure 7-129 Connectivity - Tools - Removable Media

6.) Click the **Format** button.

When CD formatting is complete, a formatting successful message is displayed together with details of the CD capacity.

7-8-2-2 Enabling Extensive Logging

NOTE: In some cases, the user may need to activate the Extensive Logging feature. This will allow the system to record logs in a more detailed format, specifically addressing an issue of suspected failure.

As shown in Figure 7-130 on page 7-169, checkboxes provided in the Extensive Logging dialog enable the user to activate the appropriate failure category (any one or more; any combination) to collect more information regarding particular functionality.
Table 7-4 provides recommendations for activating a specific Extensive Log category.

Table 7-4 Extensive Log Categories and Failure Scenarios

Extensive Log Category	Type of Failure
Archive	Loss of patient information or images
	System lock-up due to database corruption
	Display of message warning that the archive is corrupted
	Any suspicion that there may be a problem with the archive
Connectivity	Network is not set up correctly
	Losing network connection
	Problems connecting to a DICOM server (or Reviewing Station)
	Problems with workflow
Front End	Impaired image quality
	Probe not detected
	System boots-up into Fake Mode (no Front End detected)
	Noise, artifacts, etc.
Media Handling	System Lock-up when using removable media (MOD, CD, Disk-on-Key)
	Removable media corrupted during back-up or export
	Removable media not detected
Power Management	Image not sufficiently intense
	Battery charging failed
	System boot-up fails intermittently
	System lock-up during mid-process

1.) Perform step 1 and step 2 on page 7-165.

2.) Click the **Extensive Log** button (refer to Figure 7-127 on page 7-166).

The Extensive Logging dialog opens - see Figure 7-130, below.

3.) Flag the appropriate checkboxes to activate the categories for which detailed analysis is required (refer to the recommendations in Table 7-4).

Figure 7-130 Extensive Logging Dialog

Note: The impact of activating a checkbox would be to generate larger, detailed log files. After usage, make sure to return to the default settings (unflagged) to conserve the size of the log files. After 7 days, the system will automatically return to the default settings.

4.) When done, click **OK**.

The Extensive Logging dialog closes.

7-8-2-3 Advanced Options

1.) From the System Problem Reporting dialog (Figure 7-127 on page 7-166), click the **Options** button.

The Advanced Export Options screen opens as shown in Figure 7-131.

Note: The Advanced Export Options allows you to:

a.) Control the size of log files.

b.) Specify some optional attachments to be added to the log files.

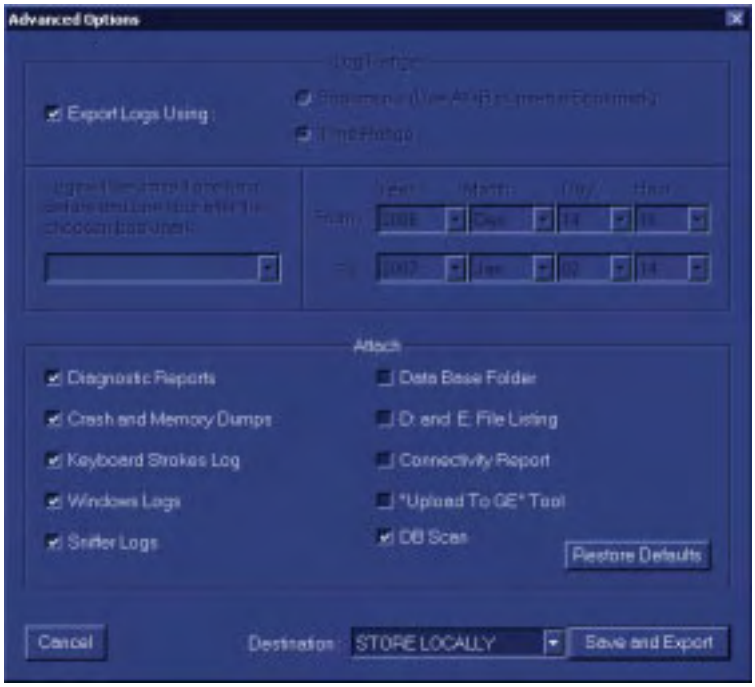


Figure 7-131 Advanced Export Options Dialog

2.) Proceed to select the appropriate settings, as described below.

7-8-2-3-1 Setting the Log File Ranges

Note: By default, the log files may be very large as they are not limited by time/date. The user is able to limit the size/timeframe of the log files by choosing the required settings, as described below.

1.) Activate the **Export Logs Using** checkbox, as shown in Figure 7-131, above.

2.) Proceed to set the required *Log Range*, as follows:

Either:

Activate the **Time Range** radio button, then use the *From:/To:* drop-down lists to define the required time range.

Or:

Activate the **Bookmark** radio button, then select the required Bookmark from the drop-down list of bookmarks.
This will export log files which are limited to the range of 1 hour before through 1 hour after the selected bookmark.

7-8-2-3-2 Setting the Log File Attachments

Note: In the Advanced Export Options dialog, from the lower area (labelled **Attach** - see Figure 7-131 on page 7-170) users may flag the different items they may wish to attach to the log files (or alternatively disable the checkboxes for those not required).
Table 7-5 outlines the different categories of information that may be attached to a log file.

Table 7-5 Attachment Categories and Recommendations for Use

Category	Type of Information and Recommended Use
Diagnostic Reports	Should be used whenever a diagnostic test has failed and it is necessary to forward the information to GE Medical Systems for analysis.
Crash and Memory Dumps	Useful for any type of memory crash or system lock-up problem.
Keyboard Strokes Log	Shows the keyboard strokes that were recorded by the system - may be useful in detection of a specific error.
Windows Logs	Contains the Windows operating system logs - supports the application operation.
Sniffer Logs	Applicable if the Network Sniffer Log has been used.
Data Base Folder	Provides more Archive information. Useful for loss of patient information and/or analysis of database, archive, or back-up problems.
D: and E: File Listing	Lists all file names and locations in the hard disk drives: **D** and **E**. Useful in the event of loss of patient information, missing images, lock-up problems, etc.
Connectivity Report	Provides details on the connectivity configuration. Recommended to include this whenever any type of connectivity problem arises.
"Upload to GE" Tool	Enables the user to export the log directly to GE Medical Systems for analysis. For details, see Sending Log Files to GE on page 7 - 172.
DBScan	Log files created when performing a scan of the database contain useful information regarding the integrity of the database.

1.) Make sure the required Log File Ranges are set, as previously described.
2.) Under **Attach**, use the checkboxes provided to flag the required attachments, as appropriate.

Note: Clicking the *Restore Defaults* button returns to the default setting whereby all checkboxes in the *left* column are flagged and all on the *right* are disabled, as shown Figure 7-131.

3.) When done, from the *Destination* drop-down menu, select the required export destination (CD or Memory Stick) then click **Save and Export**.

A Zip file (named "logfile_<date>_<time>.zip") is copied onto the selected removable media.

Note: Previously, users were required to save log files before exporting them. With version BT06, these two operations are performed as one step.

IMPORTANT When selecting CD as the export destination, first make sure that the CD has been formatted. For details, see Formatting a CD on page 7 - 167.

When export is completed, a message is displayed saying (number of) reports successfully exported.

4.) Click OK to close the window.
5.) When export completed, press **<Ctrl>+E** to eject the media.

7-8-2-3-3 Sending Log Files to GE

After exporting logs (with the **Upload To GE Tool** attachment) to the selected media (i.e. CD or Memory Stick), the media contains the zipped log file along with the binary (**UploadLog.exe** and other attachments) files that perform the upload of all exported files to the GE ftp site.

NOTE: Successful upload of logs to the GE ftp site can only be achieved when the designated PC is connected to the Internet and when all security measures (such as, firewalls) taken at the local network do not prevent the utility from performing the upload.

To Perform the Upload Procedure:

1.) Place the media in any Windows-based PC and run the **UploadLog.exe**.

The Upload Log dialog is displayed:

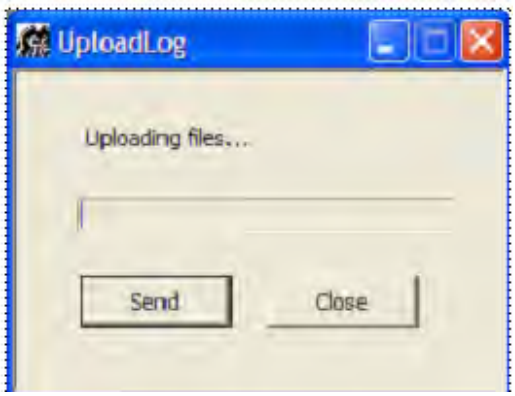


Figure 7-132 Uploading Log Files

2.) Click **Send**.

The upload process commences and the progress bar advances.

When the upload process finishes, the following message is displayed:

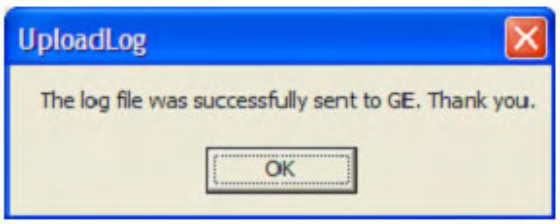


Figure 7-133 Upload Successful Message

3.) Click **OK**.

4.) Observe the progress bar completion, as shown in Figure 7-134.

Figure 7-134 Upload Complete

5.) Click **Close** to terminate and exit the Upload utility.

6.) Inform the local GE personnel that you have uploaded files to the GE ftp site.

Note: In the event that the upload process fails, check your local network security settings to make sure that they did not prevent the upload. Otherwise, contact GE personnel.

7-8-2-4 DB Scan

To Perform the Database Scan Procedure:

1.) Press **<ALT> + D**.

The System Problem Reporting dialog opens:.

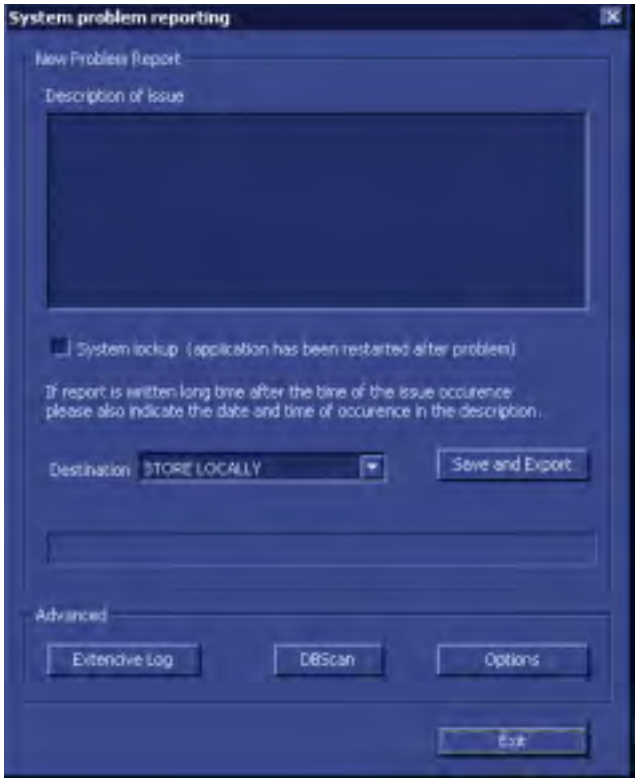


Figure 7-135 System Problem Reporting - Advanced

2.) Under *Advanced*, click on the **DBScan** button.

The Database Scanning procedure commences, and a progress bar is displayed together with the message: The action may take a long time. Please wait.....

New Problem Report
Description of issue
System lockup (application has been restarted after problem)
If report is written long time after the time of the issue occurence
please also indicate the date and time of occurence in the description.
Destination
STORE LOCALLY
Save and Export
The action may take a long time. Please wait...
Advanced
Extensive Log
Stop DBScan
Options
Exit

Figure 7-136 Database Scanning Procedure in Progress

*During this procedure, a log file which contains information about the integrity of the database will automatically be created and stored in the **Logs** directory (in the folder name **Log**).*

If required, this log file may be sent as an attachment when exporting log files. For more details, see *Setting the Log File Attachments on page 7 - 171.*

7-8-2-5 Other Logs

Other available logs can be viewed via the Common Service Interface - refer to the Error Logs Page on page 7 - 131.

Chapter 8
Replacement Procedures

Section 8-1
Overview

8-1-1 Purpose of Chapter 8

This chapter provides replacement procedures for Vivid-i™ system parts, as outlined below.

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Section 8-2
External Component Replacement Procedures

8-2-1 Bearing Handle Replacement Procedure

NOTE: The term "Bearing Handle" relates to the Vivid-i™ portable carrying handle.

8-2-1-1 Tools

Use the appropriate flat and Phillips-type screw drivers as indicated in the Bearing Handle replacement procedure.

8-2-1-2 Time Required

10 minutes

8-2-1-3 Preparations

None

8-2-1-4 Bearing Handle Removal Procedure

1) Close the Vivid-i™ LCD cover, making sure both front latches are securely fastened.

Figure 8-137 Closing Vivid-i™ LCD Cover

2) Release the captive screw on either side of the Bearing Handle (there are two screws that secure the handle in position), by turning 1/4 turn in a *counterclockwise* direction.

3) Using both hands, pull the Bearing Handle slightly apart to release it from the system.

4.) Remove the Bearing Handle.

8-2-1-5 Bearing Handle Installation Procedure

1) Place a new Bearing Handle in position, using both hands to pull the Bearing Handle slightly apart in order to slot the ends into the handle holes on the Vivid-i™ casing.

2) Carefully fasten each captive screw on either side of the Bearing Handle to secure the handle in position, by turning 1/4 turn in a *clockwise* direction.

Note: When tightening the captive screws, do not use excessive force *do not apply more than 1/4 turn*; overtightening will damage the screw thread.

8-2-2 Battery Replacement Procedure

8-2-2-1 Tools

None required.

8-2-2-2 Time Required

1 minute

8-2-2-3 Preparations

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation*.

8-2-2-4 Battery Removal Procedure

1) Disconnect the AC adapter and all cables from the Vivid-i™ portable ultrasound scanner.

NOTE: The following steps may be viewed in the attached movie clip.

2) Close the Vivid-i™ LCD cover, making sure both front latches are securely fastened.

Figure 8-138 Closing Vivid-i™ LCD Cover

3) Carefully turn the Vivid-i™ over, placing it face down.

4.) While holding the Vivid-i™ steady, pull the locking latch away from the battery and slide the battery sideways out of the battery compartment to remove it completely from the system.

Figure 8-139 Sliding the Battery out of the Battery Compartment

NOTE: WHEN REMOVING A DEFECTIVE BATTERY, ENSURE THAT IT IS DISPOSED OF IN ACCORDANCE WITH LOCAL REGULATIONS. ALTERNATIVELY, FORWARD IT TO GE MEDICAL SYSTEMS FOR PROPER DISPOSAL.

8-2-2-5 Battery Installation Procedure

WARNING: The Vivid-i™ battery has a safety device.
***DO NOT ATTEMPT TO DIS-ASSEMBLE OR ALTER THE BATTERY*!**
Always observe the precautions listed in *Vivid-i™ Battery Safety* on page 1 - 14**.**

CAUTION: USE ONLY BATTERIES APPROVED BY GE MEDICAL SYSTEMS AS SUITABLE FOR USE WITH THE VIVID-I™ PORTABLE ULTRASOUND SCANNER

1) With the Vivid-i™ lying face down (refer to Figure 8-139 on page 8-3), hold the unit steady with one hand while sliding the battery sideways into the battery compartment.
2.) Make sure the battery is properly inserted all the way, before pushing the locking latch to the closed position.
3.) Turn the Vivid-i™ over, release the front latches and open the LCD cover.
4.) Reconnect the AC adapter and all cables to the Vivid-i™ portable ultrasound scanner.

8-2-3 Hard Disk Replacement Procedure

NOTE: When replacing the BEP or Hard Disk, one must either obtain new access codes that will fit the system ID which is programmed on the BEP, or program the BEP system ID to fit the access codes already registered in the Hard Disk. Only qualified personnel should perform these tasks.

8-2-3-1 Tools

Use the appropriate flat and Phillips-type screw drivers as indicated in the Hard Disk replacement procedure.

8-2-3-2 Time Required

10 minutes

8-2-3-3 Preparation

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation*.

8-2-3-4 Hard Disk Removal Procedure

1) Make sure the Vivid-i™ LCD Display cover is securely closed and that the scanner is standing firmly on a flat surface.

NOTE: The following step may be viewed in the attached movie clip.

2) Working from the rear of the scanner (rear panel), use a small Phillips screwdriver to loosen and remove the two screws that secure the Hard Disk in the hard disk module holder, as shown in Figure 8-140 below.

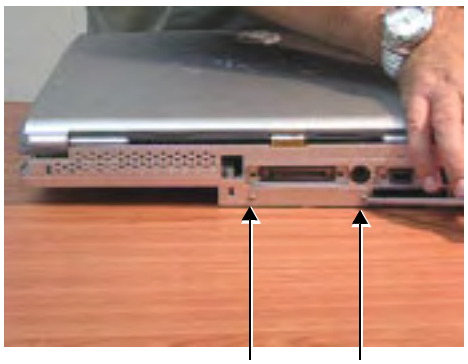


Figure 8-140 Removing the Screws from the Rear Panel

NOTE: The following step may be viewed in the attached movie clip.

3) With both hands, tilt the rear end of the scanner *upwards* then, holding it steady with one hand, remove the Hard Disk from the system by holding the grip and pulling it straight out of the hard disk module holder, as shown in Figure 8-140 below.

Figure 8-141 Removing the Hard Disk

8-2-3-5 Hard Disk Installation Procedure

NOTE: When replacing the BEP or Hard Disk, one must either obtain new access codes that will fit the system ID which is programmed on the BEP, or program the BEP system ID to fit the access codes already registered in the Hard Disk. Only qualified personnel should perform these tasks.

NOTE: When performing the following installation procedure steps, it may be helpful to review the appropriate movie clips previously referenced in the Hard Disk Removal Procedure.

1) Place the new hard disk in position in the hard disk module holder - see Figure 8-141 on page 8-5.
2) Return and fasten the two screws (previously removed) to secure the Hard Disk in position - refer to Figure 8-140 on page 8-5.

Note: When a new hard disk arrives from the manufacturer, usually it is partitioned and ready for software installation.
Refer to Software Loading on page 8 - 74 for software installation instructions .

Note: IMPORTANT - if ***both*** the Hard Disk and Back End are being replaced simultaneously, it is necessary to re-configure the LCD type. Refer to the instructions provided in step 13 on page 8-38 through step 16 on page 8-40.

8-2-4 Control Panel and Keyboard Replacement Procedure

8-2-4-1 Tools

Use the appropriate Phillips and flat screw drivers, as indicated in the following Control Panel and Keyboard (and sub-component) replacement procedures.

8-2-4-2 Time Required

10 minutes

8-2-4-3 Preparations

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation*.

8-2-4-4 Control Panel and Keyboard Removal Procedure

1) Remove the bearing handle, as described in the Bearing Handle Removal Procedure on page 8 - 2.

2) Place the Vivid-i™ portable ultrasound scanner face down and remove the battery as described in the Battery Removal Procedure on page 8 - 3.

NOTE: The following step may be viewed in the attached movie clip.

3) Loosen and remove each of the 9 screws that fasten the Control Panel and Keyboard onto the Bottom Assembly, as indicated in Figure 8-147 below.

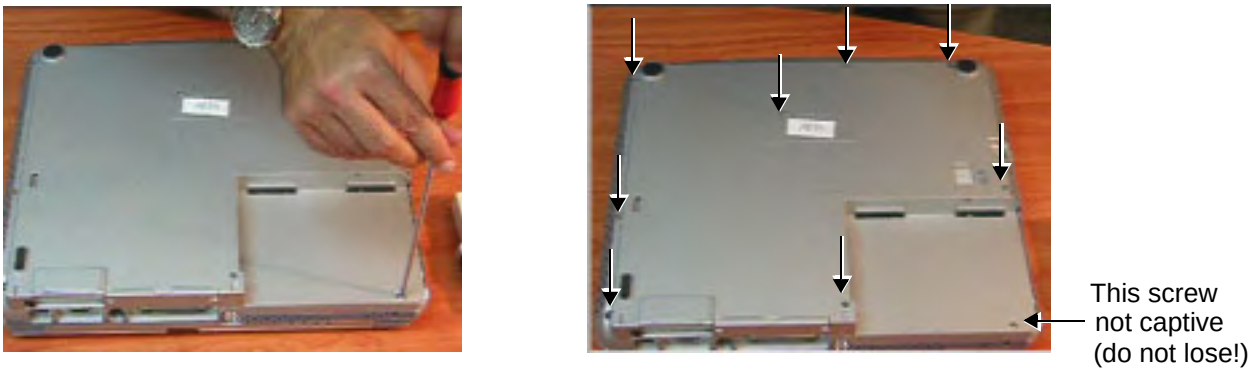


Figure 8-147 Removing the Fastening Screws from the Bottom Assembly

4.) Turn the Vivid-i™ over, release the front latches and open the LCD Display cover.

NOTE: The following step may be viewed in the attached movie clip.

5) Carefully lift the Control Panel and Keyboard upwards from the front, then release it from the rear; remove it from the Vivid-i™ and place it next to the system, as shown in Figure 8-148.

Figure 8-148 Removing the Control Panel and Keyboard

NOTE: The following step may be viewed in the attached movie clip.

NOTE: When removing the Control Panel and Keyboard during other replacement procedures, Step 6 will only be required if indicated.

6) Lift the Control Panel and Keyboard up to gain access to the cable connector underneath and disconnect the control panel/keyboard cable from the system as shown in Figure 8-149.

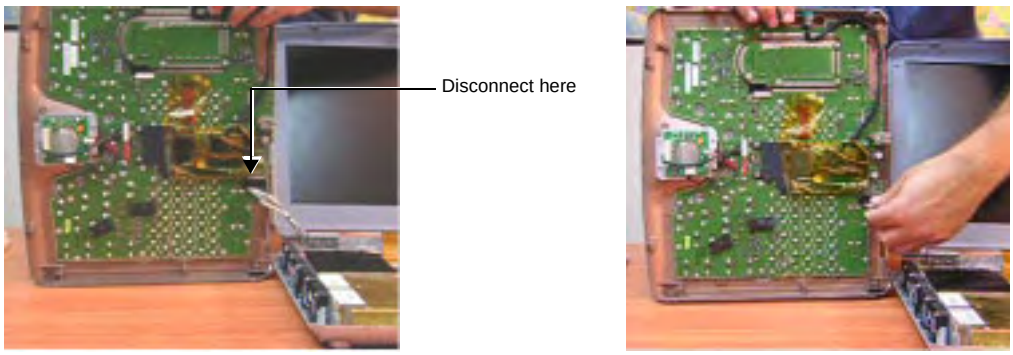


Figure 8-149 Disconnecting the Control Panel/Keyboard Cable

8-2-4-5 Control Panel and Keyboard Installation Procedure

NOTE: When performing the following installation procedure steps, it may be helpful to review the appropriate movie clips previously referenced in the Control Panel and Keyboard Removal Procedure.

NOTE: When installing the Control Panel and Keyboard during other replacement procedures, Step 1 will only be required if indicated.

1) Stand the replacement Control Panel and Keyboard beside the Vivid-i™ system and tilt it on its side to gain access to the cable connector underneath. Re-connect the keyboard/control panel cable from the system to the cable connector (refer to Figure 8-149, above).

2) Carefully lift the Control Panel and Keyboard into position on the Vivid-i™ (refer to Figure 8-148, above). Make sure it is properly seated and take care to align the screw holes with those in the Bottom Assembly.

3.) Close the Vivid-i™ LCD Display cover, making sure both front latches are securely fastened.

4.) Carefully turn the Vivid-i™over, placing it face down.

5.) Return and fasten each of the 9 screws that secure the Control Panel and Keyboard onto the Bottom Assembly (refer to Figure 8-147, above).

6.) Re-install the battery as described in the Battery Installation Procedure on page 8 - 4.

7.) Return the Handle as described in the Bearing Handle Installation Procedure on page 8 - 2.

8) Reconnect the AC adapter and all cables to the Vivid-i™ portable ultrasound scanner.

9.) Perform the appropriate functional tests of the system, as described in *Chapter 4 - Functional Checks*.

8-2-4-5-1 Keycap Removal Procedure

NOTE: Replacement Keycaps for the Vivid-i™ system are supplied as part of the Keycap Kit - Part No. 2410799.

1) Carefully place a small flat screw driver between the keycap you wish to remove and its neighboring keycap.
2) Use the screw driver to gently lever off the defective keycap, until it is completely loosened from its base (see Figure 8-150 below).
3.) Lift off and remove the defective keycap.

Figure 8-150 Keycap Replacement

8-2-4-5-2 Keycap Installation Procedure

1) Carefully place the appropriate new keycap in position on the keyboard, taking care to place the plastic alignment pin in the correct position so that the keycap is the right way up and reads correctly.
2) Gently push the keycap down until it snaps into position.

8-2-4-5-3 Trackball Removal Procedure

NOTE: This section describes the replacement procedure for Trackball Assembly - Part No. 2405164-2.

1) Lift the Control Panel and Keyboard up to gain access to the cable connector underneath and disconnect the keyboard/control panel cable from the system - refer to Figure 8-149 on page 8-8.

2) Tilt the Control Panel and Keyboard on its side and loosen and remove the four screws (two on either side of the bracket) that fasten the trackball assembly to the base of the Control Panel, as shown in Figure 8-151 below.

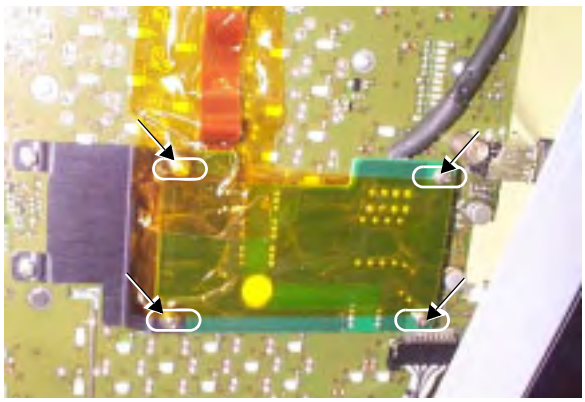


Figure 8-151 Trackball Removal

3.) Disconnect the three trackball cable connectors from the trackball assembly (carefully pull them out) and remove the trackball assembly from the Control Panel.

8-2-4-5-4 Trackball Installation Procedure

1) Return a new trackball assembly to the correct location on the Control Panel.

2) Carefully tilt the Control Panel and Keyboard on its side and return and fasten the four screws (two on either side of the bracket) to secure the trackball assembly to the base of the Control Panel (refer to Figure 8-151, above).

3) Re-connect the three trackball cable connectors (carefully push them in) to the trackball assembly.

8-2-4-5-5 ATGC Slider Keycap Removal Procedure

NOTE: This section describes the replacement procedure for ATGC Slider keycaps (supplied as part of the Keyboard Assembly - Part No. 2376512-2).

1) Carefully place a small flat screw driver between the ATGC slider keycap you wish to remove and the surface of the keyboard.
2) Use the screw driver to gently lever off the defective keycap, until it is completely loosened from its base.
3.) Lift off and remove the defective keycap - see Figure 8-150 below.

Figure 8-152 ATGC Slider Keycap Replacement

8-2-4-5-6 ATGC Slider Keycap Installation Procedure

1) Carefully place a new slider keycap in position on the slider base, taking care to place the plastic alignment pin in the correct location.
2) Gently push the slider keycap down until it snaps into position.

8-2-4-5-7 ATGC Rotary Knob Removal Procedure

NOTE: This section describes the replacement procedure for ATGC Rotary knob (supplied as part of the Keyboard Assembly - Part No. 2376512-2)

1) Carefully place a small flat screw driver between the ATGC Rotary knob and the surface of the keyboard - see Figure 8-150 below.
2) Use the screw driver to gently lever off the defective rotary knob, until it is completely loosened from its base.

3.) Lift off and remove the defective knob - see Figure 8-153 below.

Figure 8-153 ATGC Rotary Knob Replacement

8-2-4-5-8 ATGC Rotary Knob Installation Procedure

1) Carefully place a new ATGC Rotary Knob in position on the keyboard, taking care to place the plastic alignment pin in the correct location.
2) Gently push the ATGC Rotary Knob down until it snaps into position.

8-2-4-5-9 ECG Module Assembly Removal Procedure

NOTE: This section describes the replacement procedure for the ECG Module Assembly - Part No. 2369811.

1) Lift the Control Panel and Keyboard up to gain access to the cable connector underneath and disconnect the keyboard/control panel cable from the system - refer to Figure 8-149 on page 8-8.
2) Tilt the Control Panel and Keyboard on its side. Disconnect the ECG Module cable from the base of the Control Panel (use a flat screwdriver to loosen the securing nut) - see Figure 8-154 below.

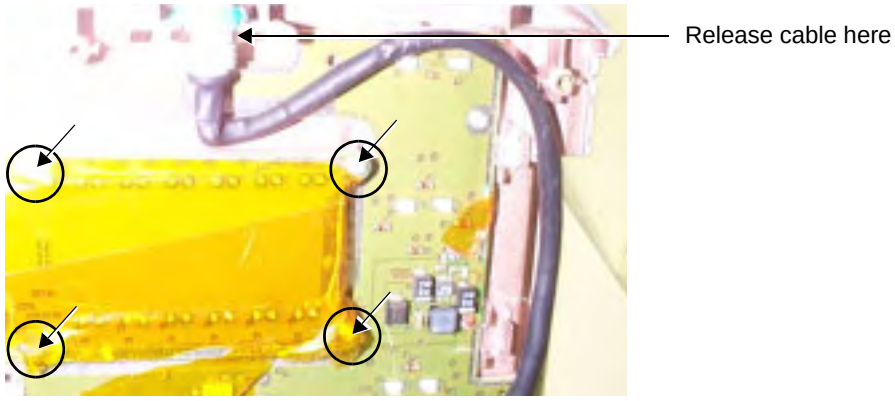


Figure 8-154 ECG Module Assembly Removal

3) Loosen and remove the four hex nuts (two on either side of the bracket) that fasten the ECG Module assembly to the base of the Control Panel, as shown in Figure 8-151, above.
4.) Carefully remove the ECG module assembly from the base of the Control Panel.

8-2-4-5-10 ECG Module Assembly Installation Procedure

1) Carefully tilt the Control Panel and Keyboard on its side.
2) Return a new ECG Module assembly to the correct location on the base of the Control Panel.
3) Return and fasten the four hex nuts (two on either side of the bracket) to secure the ECG Module assembly to the base of the Control Panel (refer to Figure 8-154, above).
4) Re-connect the ECG Module cable to the base of the Control Panel (use a flat screwdriver to tighten the securing nut) - see Figure 8-154, above.

8-2-5 Rear Cover & Latch Assembly Replacement Procedure

NOTE: This section describes the replacement procedure for Rear Cover & Latch Assembly - supplied as part of the Cover Kit - Part No. 2412825.

8-2-5-1 Tools

None required.

8-2-5-2 Time Required

30 minutes

8-2-5-3 Preparations

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation*.

8-2-5-4 Rear Cover & Latch Assembly Removal Procedure

1) Disconnect the AC adapter and all cables from the Vivid-i™ portable ultrasound scanner.
2) Remove the Bearing Handle as described in the Bearing Handle Removal Procedure on page 8 - 2.
3) Remove the Control Panel and Keyboard as described in the Control Panel and Keyboard Removal Procedure on page 8 - 7.
4) Remove the LCD Display Frame as described in the LCD Display Frame Removal Procedure on page 8 - 18.
5) Remove the Microphone Assembly as described in the Microphone Assembly Removal Procedure on page 8 - 46.
6) Remove the LCD Display; see the LCD Display Removal Procedure on page 8 - 35.
7.) Loosen and remove the two screws on each of the *left* and *right* hinges (attached to the Rear Cover and Latch Assembly), as shown in Figure 8-155 below.

Figure 8-155 Removing the Hinge Screws

8.) Lift the Rear Cover and Latch Assembly away from the Bottom Assembly and remove completely from the system.

8-2-5-5 Rear Cover & Latch Assembly Installation Procedure

1.) Return the Rear Cover and Latch Assembly to the system and place it in position on the Bottom Assembly, carefully checking that the *left* and *right* hinges are properly aligned.
2.) Return and fasten the two screws on each of the *left* and *right* hinges (previously removed - refer to Figure 8-155).
3) Return the LCD Display; see the LCD Display Installation Procedure on page 8 - 38.
4) Return the Microphone Assembly as described in the Microphone Assembly Installation Procedure on page 8 - 47.
5) Return the LCD Display Frame as described in the LCD Display Frame Installation Procedure on page 8 - 19.

6) Return the Control Panel and Keyboard as described in the Control Panel and Keyboard Installation Procedure on page 8 - 8.

7) Return the Bearing Handle as described in the Bearing Handle Installation Procedure on page 8 - 2.

8) Reconnect the AC adapter and all cables to the Vivid-i™ portable ultrasound scanner.

8-2-6 Bottom Assembly Replacement Procedure

8-2-6-1 Tools

Use the appropriate Phillips and flat screw drivers, as indicated in the bottom assembly replacement procedures.

8-2-6-2 Time Required

30 minutes

8-2-6-3 Preparations

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation*.

8-2-6-4 Bottom Assembly Removal Procedure

1) Remove the battery as described in the Battery Removal Procedure on page 8 - 3.
2) Remove the bearing handle as described in the Bearing Handle Removal Procedure on page 8 - 2.
3) Remove the hard disk as described in the Hard Disk Removal Procedure on page 8 - 5.
4) Remove the Control Panel and Keyboard as described in the Control Panel and Keyboard Removal Procedure on page 8 - 7.
5) Remove the P&M Board as described in the P&M (Probe and MUX) Board Removal Procedure on page 8 - 20.
6) Remove the TR32 and RFI Boards as described in the TR32 and RFI Boards Removal Procedure on page 8 - 22.
7) Remove the BEP as described in the BEP Removal Procedure on page 8 - 26.
8) Remove the HVPS as described in the HVPS Removal Procedure on page 8 - 29.
9) Remove the fans as described in the Fan Removal Procedure on page 8 - 31.
10) Remove the LCD Display Frame as described in the LCD Display Frame Removal Procedure on page 8 - 18.
11.) Separate the Bottom Assembly from the LCD Display rear cover by loosening and removing the two screws on each of the *left* and *right* hinges (attached to the Rear Cover and Latch Assembly). Refer to Figure 8-155 on page 8-14.
12.) Remove the Bottom Assembly from the system.

8-2-6-5 Bottom Assembly Installation Procedure

1) Return a new Bottom Assembly to the system.
2.) Attach the LCD Display rear cover to the Bottom Assembly, carefully aligning the *left* and *right* hinges (attached to the Rear Cover and Latch Assembly) and returning and fastening the two screws on each side, as shown in Figure 8-155 on page 8-14.

Note: ***Do not overtighten the screws*.**

3.) Return the LCD Frame as described in the LCD Display Frame Installation Procedure on page 8 - 19
4) Return the fans as described in the Fan Installation Procedure on page 8 - 33.
5) Return the HVPS as described in the HVPS Installation Procedure on page 8 - 30.
6) Return the BEP as described in the BEP Installation Procedure on page 8 - 28.

7) Return the TR32 and RFI Boards as described in the TR32 and RFI Boards Installation Procedure on page 8 - 25.

8) Return the P&M Board as described in the P&M (Probe and MUX) Board Installation Procedure on page 8 - 21.

9) Return the Control Panel and Keyboard as described in the Control Panel and Keyboard Installation Procedure on page 8 - 8.

10) Return the hard disk as described in the Hard Disk Installation Procedure on page 8 - 6.

11) Return the bearing handle as described in the Bearing Handle Installation Procedure on page 8 - 2.

12.) Re-install the battery as described in the Battery Installation Procedure on page 8 - 4.

13.) Perform the appropriate functional tests of the system, as described in *Chapter 4 - Functional Checks*.

8-2-7 LCD Display Frame Replacement Procedure

8-2-7-1 Tools

Use the appropriate Phillips and flat screw drivers, as indicated in the bottom assembly replacement procedures.

8-2-7-2 Time Required

10 minutes

8-2-7-3 Preparations

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation*.

8-2-7-4 LCD Display Frame Removal Procedure

NOTE: The following step may be viewed in the attached movie clip.

1) With the LCD Display in the open (upright) position, remove the screw cap from each of the four screws that fasten the LCD display frame in position, as shown in Figure 8-156 below.

Figure 8-156 Removing the Screw Caps from the LCD Display Frame

NOTE: The following step may be viewed in the attached movie clip.

2) Loosen and remove the four screws.

NOTE: The following step may be viewed in the attached movie clip.

3) With the LCD Display in the fully open position, carefully release the LCD display frame from the securing clips on all four sides, using both hands to release and lift it away from the LCD display.

Figure 8-157 Removing the LCD Display Frame

8-2-7-5 LCD Display Frame Installation Procedure

NOTE: When performing the following installation procedure steps, it may be helpful to review the appropriate movie clips previously referenced in the LCD Display Frame Removal Procedure.

1) With the LCD Display in the fully open position, return the LCD display frame to the correct position and using both hands, press the frame under the securing clips on all four sides to fasten it against the LCD display. Refer to Figure 8-157 on page 8-18.
2) Return and tighten the four screws (previously removed).
3) With the LCD Display in the open (upright) position, return the screw cap to each of the four screws that fasten the LCD frame in position, as shown in Figure 8-156 on page 8-18.

Section 8-3
Internal Component Replacement Procedures

NOTE: When performing Internal Component Replacement Procedures, generally it is not necessary to disconnect and completely remove the Control Panel and Keyboard from the system. Simply remove it from the Bottom Assembly and lay it next to the Vivid-i™ portable ultrasound scanner, as shown in Figure 8-148 on page 8-7.

*NOTE: When tightening screws, **do not overtighten or use excessive force**.*

CAUTION: DO NOT TOUCH ANY BOARDS WITH INTEGRATED CIRCUITS PRIOR TO TAKING THE NECESSARY ESD PRECAUTIONS:

1.ALWAYS CONNECT YOURSELF, VIA AN ARM-WRIST STRAP, TO THE ADVISED ESD CONNECTION POINT LOCATED ON THE REAR OF THE SCANNER (TO THE RIGHT OF THE POWER CONNECTOR).

2.FOLLOW GENERAL GUIDELINES FOR HANDLING OF ELECTROSTATIC SENSITIVE EQUIPMENT.

8-3-1 P&M (Probe and MUX) Board Replacement Procedure

8-3-1-1 Tools

Use the appropriate Phillips and flat screw drivers, as indicated in the bottom assembly replacement procedures.

8-3-1-2 Time Required

15 minutes

8-3-1-3 Preparations

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation*.

8-3-1-4 P&M (Probe and MUX) Board Removal Procedure

1) Remove the bearing handle, as described in the Bearing Handle Removal Procedure on page 8 - 2.
2) Remove the Control Panel and Keyboard, as described in the Control Panel and Keyboard Removal Procedure on page 8 - 7.
3) Loosen and remove the three screws that secure the P&M Board to the RFI Board, as shown in Figure 8-158 below.

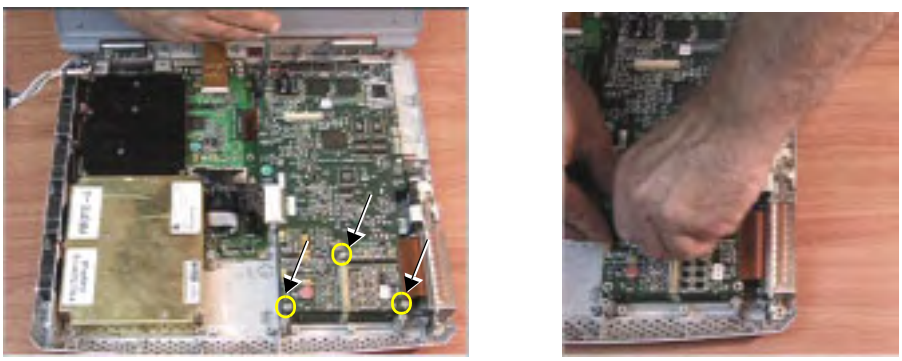


Figure 8-158 Removing the Screws that Secure the P&M Board to the RFI Board

NOTE: The following steps may be viewed in the attached movie clip.

4.) Loosen the two screws that fasten the P&M Board to the Bottom Assembly, as shown in Figure 8-166 below

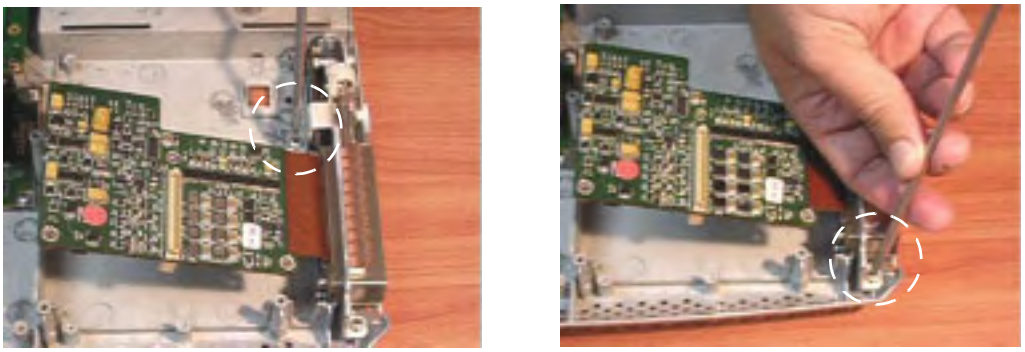


Figure 8-159 Loosening the Screws from the P&M Board

5.) Lift the P&M Board *upwards* away from the Bottom Assembly and remove it completely, as shown in Figure 8-160 below

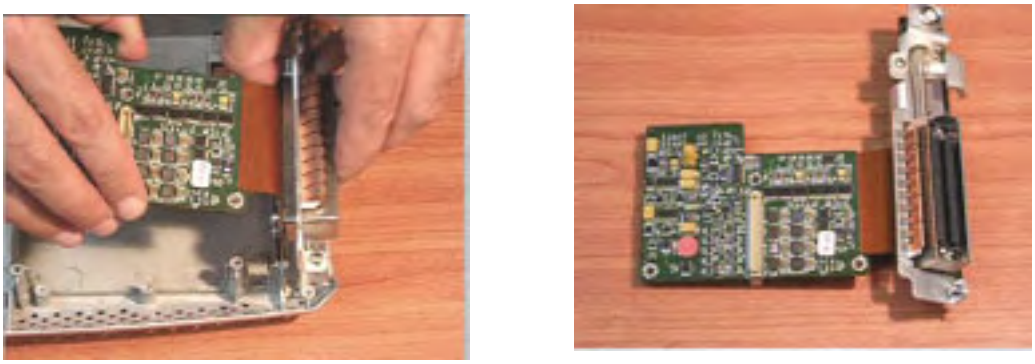


Figure 8-160 Removing the Probe and MUX Board from the Bottom Assembly

8-3-1-5 P&M (Probe and MUX) Board Installation Procedure

NOTE: When performing the following installation procedure steps, it may be helpful to review the appropriate movie clips previously referenced in the P&M (Probe and MUX) Board Removal Procedure.

CAUTION: When installing boards, ESD may cause damage to a board. Always have the ESD hand strip connected to the machine chassis and to your hand.

1) Return a new P&M Board to the system, pushing it *downwards* into position on the Bottom Assembly. Make sure it is properly seated before returning and fastening the two screws (previously removed). Refer to Figure 8-160 and Figure 8-159, above.

2.) Return and fasten the three screws to secure the P&M Board to the RFI Board, as shown in Figure 8-158 on page 8-20.

3.) Return the Control Panel and Keyboard, as described in the Control Panel and Keyboard Installation Procedure on page 8 - 8

4.) Return the bearing handle, as described in the Bearing Handle Installation Procedure on page 8 - 2.

5.) Perform the appropriate functional tests of the system, as described in *Chapter 4 - Functional Checks*.

8-3-2 TR32 and RFI Boards Replacement Procedure

CAUTION: When removing the boards, ESD may cause damage to a board. Always have the ESD hand strip connected to the machine chassis and to your hand.

8-3-2-1 Tools

Use the appropriate Phillips and flat screw drivers, as indicated in the bottom assembly replacement procedures.

8-3-2-2 Time Required

15 minutes

8-3-2-3 Preparations

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation*.

8-3-2-4 TR32 and RFI Boards Removal Procedure

1) Remove the bearing handle, as described in the Bearing Handle Removal Procedure on page 8 - 2.
2) Remove the Control Panel and Keyboard, as described in the Control Panel and Keyboard Removal Procedure on page 8 - 7.

NOTE: The following step may be viewed in the attached movie clip.

3) Loosen the seven screws that secure the TR32 and RFI Boards to the Bottom Assembly, as shown in Figure 8-161 below.

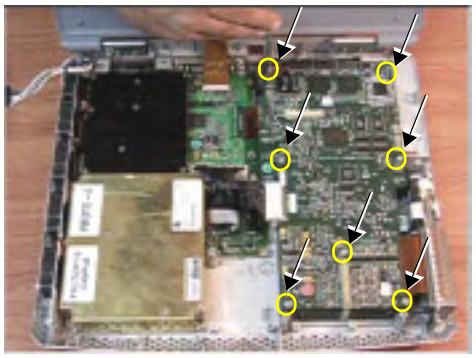


Figure 8-161 Loosen Screws that Secure TR32 and RFI Boards to Bottom Assembly

NOTE: The following step may be viewed in the attached movie clip.

4) Remove the seven screws - see Figure 8-162.

Figure 8-162 Removing the Screws

NOTE: The following step may be viewed in the attached movie clip.

5) Disconnect the PCI cable flex (BEP-to-RFI) from the cable connector on RFI Board as shown in Figure 8-163 below

Figure 8-163 Disconnecting the PCI Cable from the RFI Board

NOTE: The following step may be viewed in the attached movie clip.

6) Disconnect each of the two HVPS cables from their sockets on DC Power Supply, as shown in Figure 8-164 below.

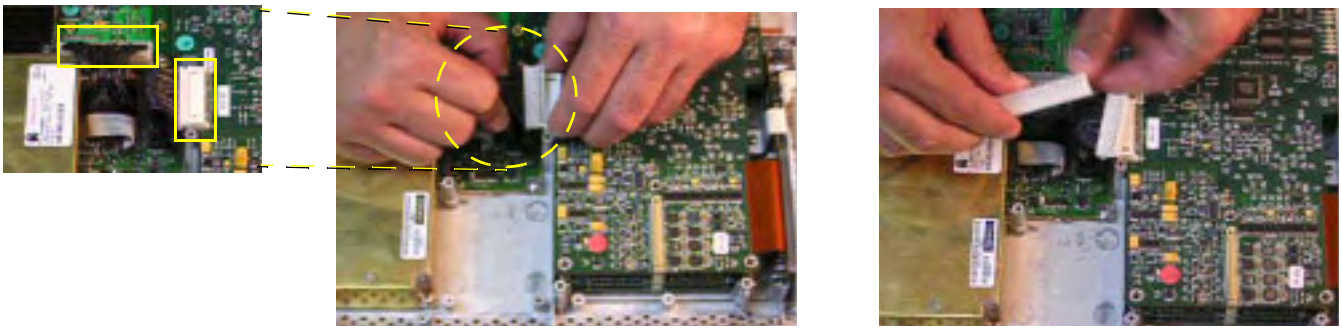


Figure 8-164 Disconnecting the DC Power Supply Cables

NOTE: The following steps may be viewed in the attached movie clip.

7) Gently lift one side of the P&M Board upwards and hinge it open to gain access to the RFI and TR32 Board assembly beneath, as shown in Figure 8-166 below. (The RFI and TR32 Boards are seated together in the system as one unit).

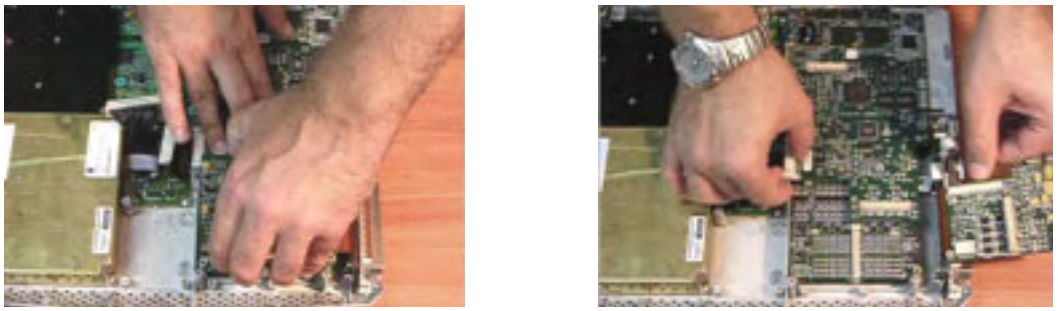


Figure 8-165 Accessing the RFI and TR32 Boards

8) Lift the RFI and TR32 Board assembly upwards and remove it from the Bottom Assembly, as shown in Figure 8-166 below

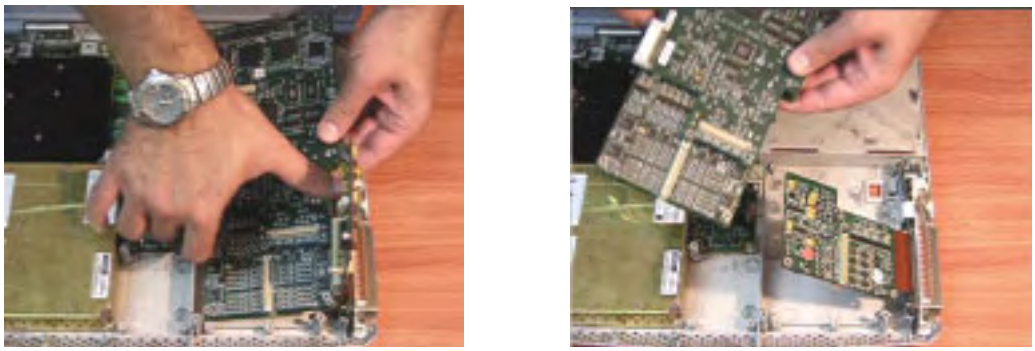


Figure 8-166 Removing the RFI and TR32 Boards from the Bottom Assembly

NOTE: The following steps may be viewed in the attached movie clip.

9.) Remove the RFI Board from the TR32 Boards (separate by gently pulling them apart), as shown in Figure 8-166 below.

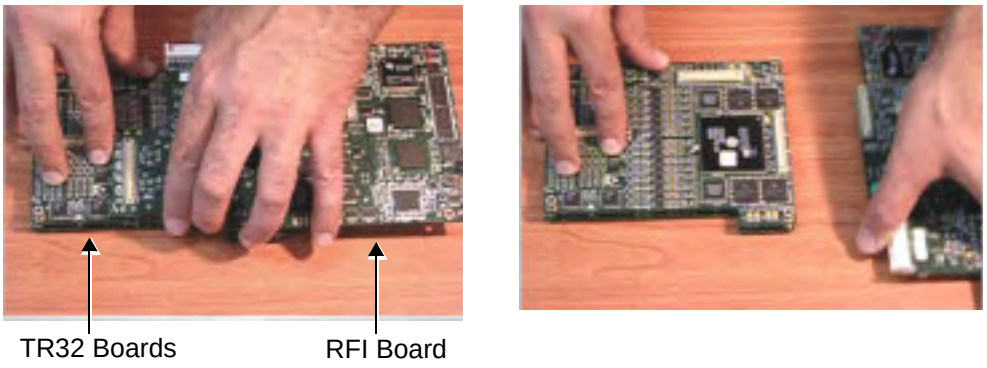


Figure 8-167 Removing the RFI Board from the TR32 Boards

10) Separate the two TR32 Boards from each other, as shown in Figure 8-166 below

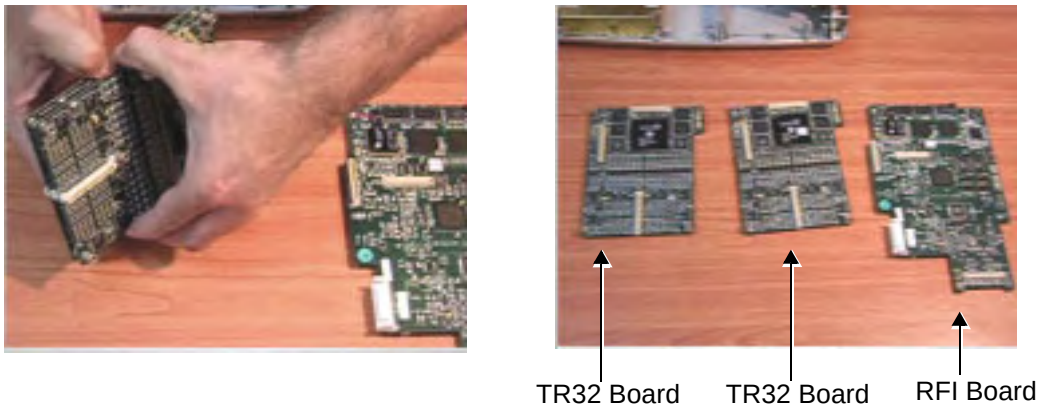


Figure 8-168 Separating the Two TR32 Boards from Each Other

Note: Replace the defective board, as described in the appropriate steps of the following procedure.

8-3-2-5 TR32 and RFI Boards Installation Procedure

NOTE: This procedure applies to replacement of one or more of the defective boards (TR32A and/or, TR32B and/or RFI).

NOTE: When performing the following installation procedure steps, it may be helpful to review the appropriate movie clips previously referenced in the TR32 and RFI Boards Removal Procedure.

CAUTION: When installing boards, ESD may cause damage to a board. Always have the ESD hand strip connected to the machine chassis and to your hand.

1) Re-connect the two TR32 Boards to each other (gently press together as shown in Figure 8-168 on page 8-24).
2) Connect the TR32 Boards to the RFI Board (gently press together as shown in Figure 8-167 on page 8-24).
3) Return the TR32 and RFI Board assembly to the system, placing it in position on the Bottom Assembly. (While performing this step, gently lift one side of the P&M Board upwards and hinge it open in order to insert the TR32 and RFI Board assembly underneath). Refer to Figure 8-165 and Figure 8-166 on page 8-24.
4.) Reconnect each of the two HVPS cables to the DC Power Supply (see Figure 8-164 on page 8-23).
5.) Reconnect the PCI cable flex (BEP-to-RFI) to the cable connector on RFI Board (see Figure 8-163 on page 8-23).
6.) Return the seven screws and fasten the TR32 and RFI Board assembly firmly in position on the Bottom Assembly (refer to Figure 8-161 and Figure 8-162 on page 8-22).
7) Return the Control Panel and Keyboard to its original position, as described in the Control Panel and Keyboard Installation Procedure on page 8 - 8.
8) Return the bearing handle, as described in the Bearing Handle Installation Procedure on page 8 - 2.
9.) Perform the appropriate functional tests of the system, as described in *Chapter 4 - Functional Checks*.

8-3-3 BEP Replacement Procedure

CAUTION: BEFORE REPLACING THE BEP, REMEMBER TO PERFORM A FULL INCREMENTAL BACK-UP OF THE ARCHIVE AND USER PRESETS.
For details, refer to the Software Installation/Upgrade Procedure Overview on page 8 - 74

8-3-3-1 Tools

Use the appropriate Phillips and flat screw drivers, as indicated in the BEP replacement procedures.

8-3-3-2 Time Required

15 minutes

8-3-3-3 Preparations

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation*.

8-3-3-4 BEP Removal Procedure

1) Remove the bearing handle, as described in the Bearing Handle Removal Procedure on page 8 - 2.
2) Make sure the Vivid-i™ LCD Display cover is securely closed and place the scanner face down. Remove the battery as described in the Battery Removal Procedure on page 8 - 3.
3) Remove the Hard Disk, as described in the Hard Disk Removal Procedure on page 8 - 5.
4) Return the Vivid-i™ to the upright position, release the latches and open the LCD Display cover to remove the Control Panel and Keyboard, as described in the Control Panel and Keyboard Removal Procedure on page 8 - 7.
5) Disconnect all the cables from the BEP.

Note: When replacing the BEP or Hard Disk, one must either obtain new access codes that will fit the system ID which is programmed on the BEP, or program the BEP system ID to fit the access codes already registered in the Hard Disk. Only qualified personnel should perform these tasks.

Proceed as follows (refer to Figure 8-169 below):

a.) Disconnect the LCD Flex ribbon cable (carefully pull back the connector to release).
b.) Disconnect the BEP-to-RFI Flex cable.
c.) Disconnect the HVPS-to-BEP power cable.
d.) Disconnect the Fan/Speaker-to-BEP power cable.

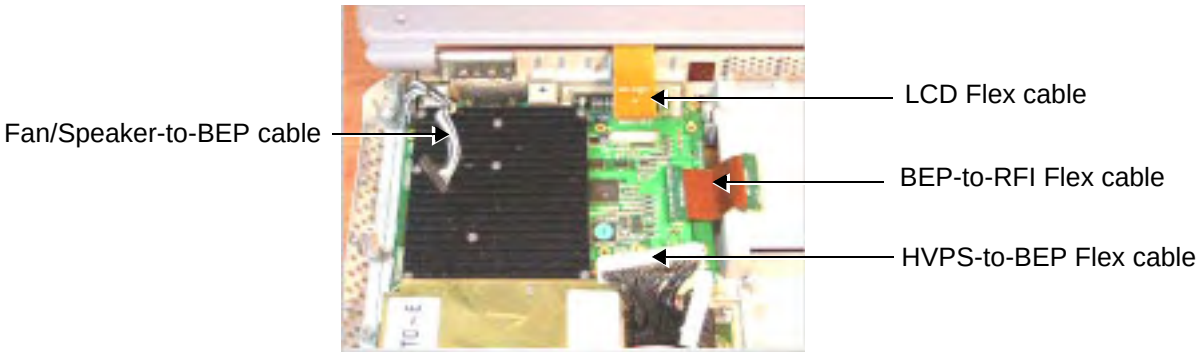


Figure 8-169 Disconnecting Cables from the BEP

NOTE: The following step may be viewed in the attached movie clip.

6) Unscrew and remove the four screws that secure the BEP to the Bottom Assembly as shown in Figure 8-175 below.

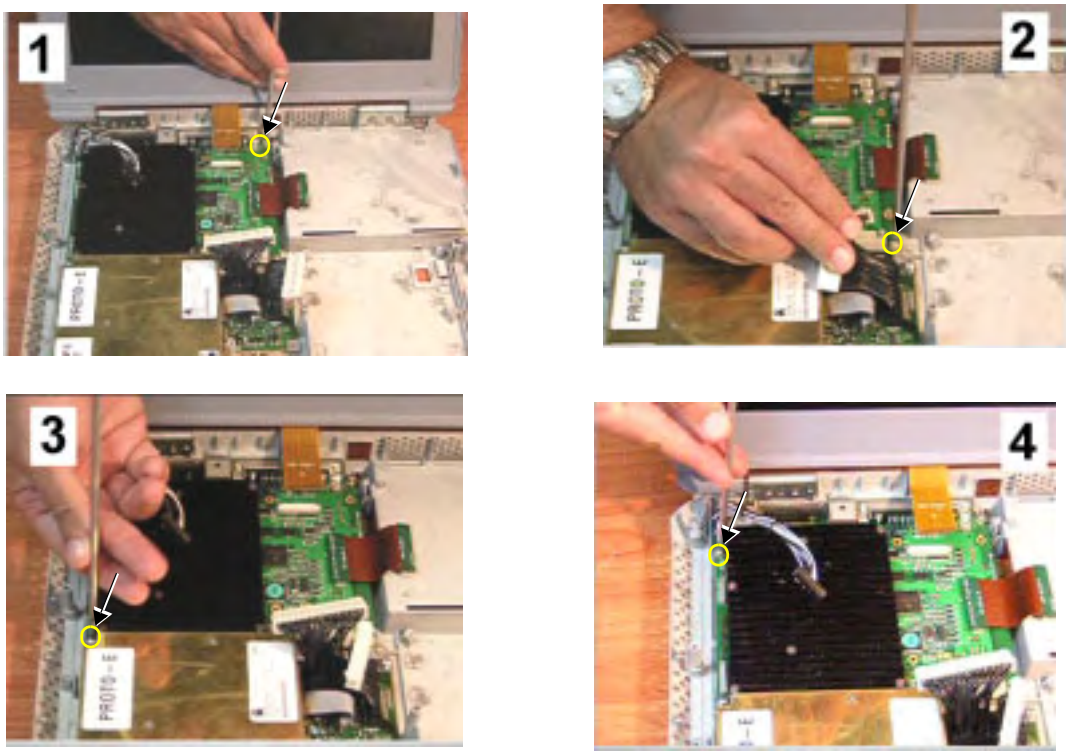


Figure 8-170 Removing the Screws from the BEP

NOTE: The following step may be viewed in the attached movie clip.

7) Using both hands, lift the BEP out of the Bottom Assembly and remove it from the system, as shown in Figure 8-175 below.

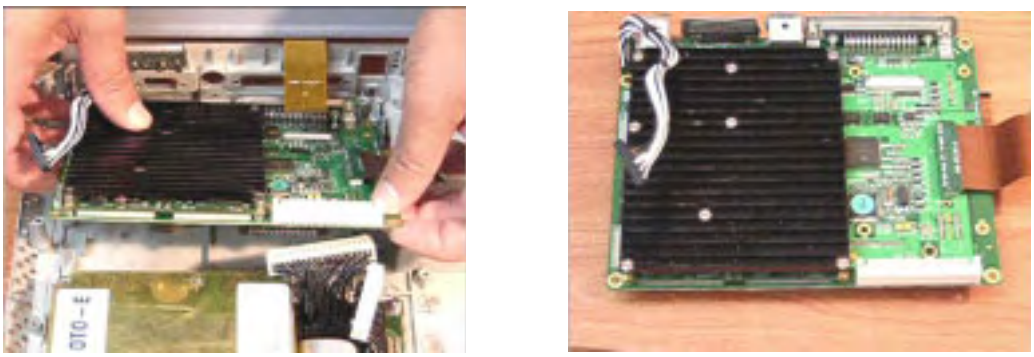


Figure 8-171 Removing the BEP from the Bottom Assembly

8-3-3-5 BEP Installation Procedure

NOTE: When performing the following installation procedure steps, it may be helpful to review the appropriate movie clips previously referenced in the BEP Removal Procedure.

1) Carefully return the new BEP to the original position on the Bottom Assembly - refer to Figure 8-171 on page 8-27.

Note: When replacing the BEP or Hard Disk, one must either obtain new access codes that will fit the system ID which is programmed on the BEP, or program the BEP system ID to fit the access codes already registered in the Hard Disk. Only qualified personnel should perform these tasks.

2) Check that the BEP is seated correctly then return and fasten the four screws (previously removed) to secure the BEP to the Bottom Assembly - refer to Figure 8-170 on page 8-27.

3) Re-connect all the cables to the BEP:

Proceed as follows (refer to Figure 8-169 on page 8-26):

a.) Re-connect the Speaker-to-BEP power cable
b.) Re-connect the Fan-to-BEP power cable.
c.) Re-connect the HVPS-to-BEP power cable.
d.) Re-connect the BEP-to-RFI Flex cable.
e.) Re-connect the LCD Flex ribbon cable (carefully push back and secure the connector).

4) Return the Control Panel and Keyboard, as described in the Control Panel and Keyboard Installation Procedure on page 8 - 8.

5) Return the Hard Disk, as described in the Hard Disk Installation Procedure on page 8 - 6.

6) Make sure the Vivid-i™ LCD Display cover is securely closed and place the scanner face down. Re-install the battery as described in the Battery Installation Procedure on page 8 - 4.

7) Return the bearing handle as described in the Bearing Handle Installation Procedure on page 8 - 2.

8.) Make sure there is no T-plug (dongle) or any other peripheral connected to the USB or PCMCIA.

9.) Turn ON the system and boot-up.

10.) Perform the PMC Update procedure, as described in Installation of PMC Version on page 8 - 98.

11.) Perform the BIOS Update procedure, as described in BIOS Firmware Update on page 8 - 83.

Note: If ***both*** the Back End and the Hard Disk are being replaced simultaneously, continue to the next step. If only the Back End is being replaced, skip step 12 and proceed to step 13, below.

12) Perform the steps required to burn the LCD type onto the newly-installed Back End, as described in step 13 on page 8-38 through step 16 on page 8-40.

13) Perform a complete functional check of the system, as described in *Chapter 4 - Functional Checks*.

8-3-4 HVPS Replacement Procedure

8-3-4-1 Tools

Use the appropriate flat and Phillips-type screw drivers, as indicated in the HVPS replacement procedure.

8-3-4-2 Time Required

15 minutes

8-3-4-3 Preparation

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation*.

8-3-4-4 HVPS Removal Procedure

1) Make sure the Vivid-i™ LCD Display cover is securely closed and place the scanner face down. Remove the battery as described in the Battery Removal Procedure on page 8 - 3.

2) Remove the bearing handle, as described in the Bearing Handle Removal Procedure on page 8 - 2.

NOTE: The following step may be viewed in the attached movie clip.

3) Disconnect each of the two Power Supply cables from the DC Power Supply (HVPS-to-BEP and HVPS-to-RFI), as shown below.

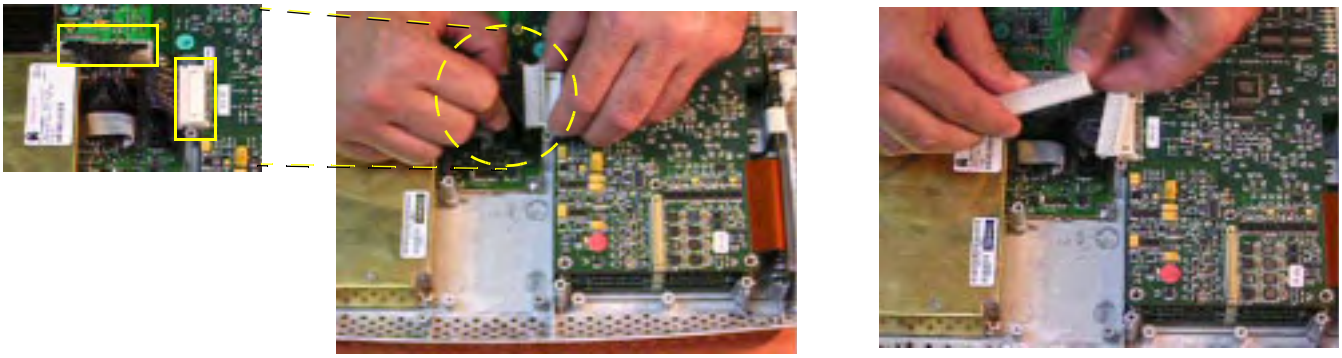


Figure 8-172 Disconnecting the DC Power Supply Cables

NOTE: The following step may be viewed in the attached movie clip.

4) Loosen the five screws that secure the DC Power Supply to the Bottom Assembly, as shown in Figure 8-161 below.

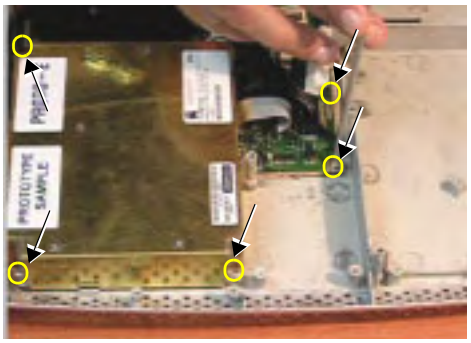


Figure 8-173 Loosening the Screws on the DC Power Supply

NOTE: The following step may be viewed in the attached movie clip.

5) Using both hands, carefully lift the DC power supply *upwards* and remove it from the Bottom Assembly, as shown in Figure 8-174 below.

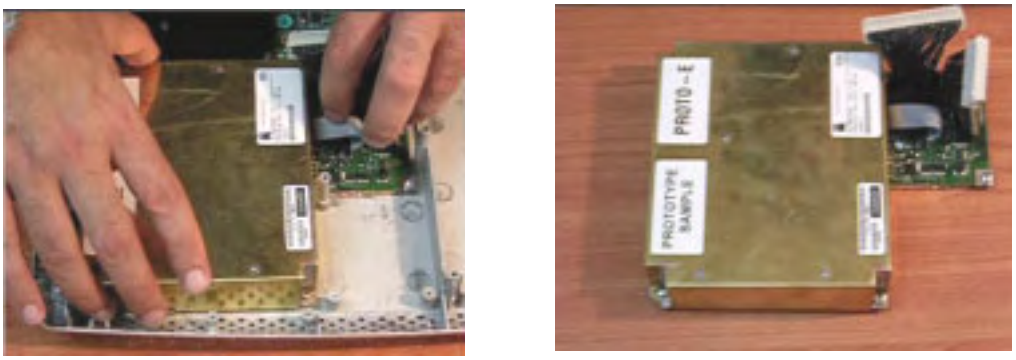


Figure 8-174 Removing the DC Power Supply

8-3-4-5 HVPS Installation Procedure

NOTE: When performing the following installation procedure steps, it may be helpful to review the appropriate movie clips previously referenced in the HVPS Removal Procedure.

1) Return the HVPS to its original position - refer to Figure 8-174, above.
2) Return the five screws and fasten the HVPS in position on the Bottom Assembly, as shown in Figure 8-173 on page 8-29.
3) Reconnect each of the two Power Supply cables to the DC Power Supply (HVPS-to-BEP and HVPS-to-RFI), as shown in Figure 8-172 on page 8-29.
4) Return the bearing handle, as described in the Bearing Handle Installation Procedure on page 8 - 2.
5) Make sure the Vivid-i™ LCD Display cover is securely closed and place the scanner face down. Re-install the battery as described in the Battery Installation Procedure on page 8 - 4.
6.) Perform the appropriate functional tests of the system, as described in *Chapter 4 - Functional Checks*.

8-3-5 Fan Replacement Procedure

NOTE: This section describes the replacement procedure for the Fan Assembly which is supplied as part of the Fans and Speaker Kit - Part No. 2412826.

8-3-5-1 Tools

Use the appropriate flat and Phillips-type screw drivers, as indicated in the fan replacement procedure.

8-3-5-2 Time Required

15 minutes

8-3-5-3 Preparation

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation*.

8-3-5-4 Fan Removal Procedure

1) Remove the bearing handle, as described in the Bearing Handle Removal Procedure on page 8 - 2.
2) Remove the Control Panel and Keyboard, as described in the Control Panel and Keyboard Removal Procedure on page 8 - 7.
3) Unscrew and remove the two screws that secure the Fan Assembly to the Bottom Assembly as shown in Figure 8-175 below.

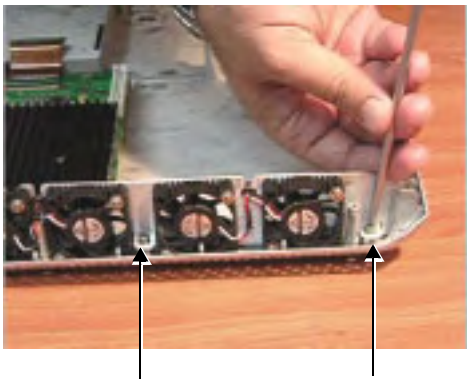


Figure 8-175 Removing the Screws from the Fan Assembly

4) Disconnect the cable from the speaker assembly.

NOTE: The following steps may be viewed in the attached movie clip.

5) Using both hands, lift the Fan Assembly *upwards* from the *front* and then the *rear* to remove it from the Bottom Assembly; lay it down adjacent to the system, ready for the next step as shown in Figure 8-176 below.

Figure 8-176 Removing the Fan Assembly

6) Disconnect the Fan cable from the BEP and completely remove the Fan Assembly from the system, as shown in Figure 8-177 below.

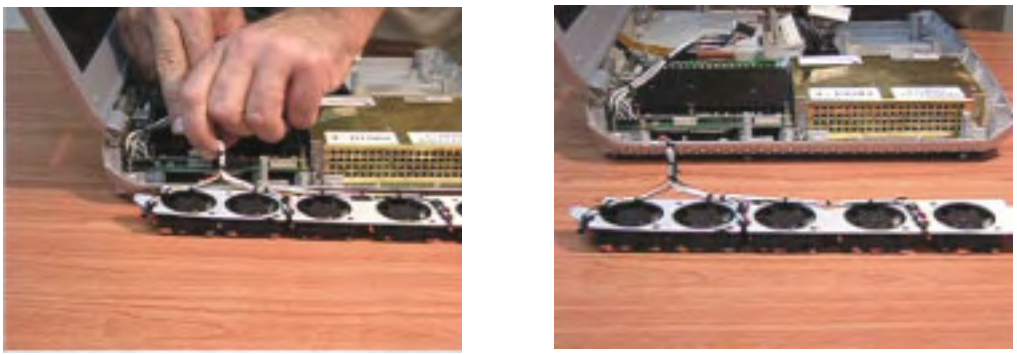


Figure 8-177 Disconnecting the Fan Cable from the BEP

8-3-5-5 Fan Installation Procedure

NOTE: When performing the following installation procedure steps, it may be helpful to review the appropriate movie clips previously referenced in the Fan Removal Procedure.

1) Connect the replacement Fan cable to the BEP- refer to Figure 8-177, above.
2) Using both hands, carefully mount the replacement Fan Assembly into position on the Bottom Assembly - refer to Figure 8-176 on page 8-32.
3) Make sure the Fan Assembly is seated in the correct position. Return and fasten the two screws (previously removed) to secure the Fan Assembly to the Bottom Assembly, as shown in Figure 8-175 on page 8-31.
4) Return the Control Panel and Keyboard, as described in the Control Panel and Keyboard Installation Procedure on page 8 - 8.
5) Return the bearing handle, as described in the Bearing Handle Installation Procedure on page 8 - 2.

8-3-6 Speaker Assembly Replacement Procedure

NOTE: This section describes the replacement procedure for the Speaker Assembly which is supplied as part of the Fans and Speaker Kit - Part No. 2412826.

8-3-6-1 Tools

Use the appropriate flat and Phillips-type screw drivers, a wire cutter and the appropriate Hex wrench keys as indicated in the speaker replacement procedure.

8-3-6-2 Time Required

15 minutes

8-3-6-3 Preparation

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation*.

8-3-6-4 Speaker Assembly Removal Procedure

1) Remove the bearing handle, as described in the Bearing Handle Removal Procedure on page 8 - 2.
2) Remove the Control Panel and Keyboard, as described in the Control Panel and Keyboard Removal Procedure on page 8 - 7.
3) Loosen and remove the two screws on each of the speaker housings (four in total).
4) Disconnect the speaker cables from the fan assembly.
5) Gently lift the speaker assembly towards you and remove from the system.

8-3-6-5 Speaker Assembly Installation Procedure

1) Return a replacement speaker assembly to the original position, ensuring that the two connection legs of each speaker are facing the two connection legs of the opposite speaker, otherwise an electrical short may occur.
2) Reconnect the speaker cables to the fan assembly.
3) Return and fasten the two screws on each of the speaker housings (four in total), previously removed.
4.) Perform the appropriate functional test of the system, as described in *Chapter 4 - Functional Checks*.

8-3-7 LCD Display Replacement Procedure

8-3-7-1 Tools

Use the appropriate Phillips and flat screw drivers, as indicated in the LCD Display replacement procedure.

8-3-7-2 Time Required

15 minutes

8-3-7-3 Preparation

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation*.

8-3-7-4 LCD Display Removal Procedure

1) Remove the bearing handle, as described in the Bearing Handle Removal Procedure on page 8 - 2.

2) Remove the Control Panel and Keyboard as described in the Control Panel and Keyboard Removal Procedure on page 8 - 7.

3.) Remove the LCD Display Frame as described in the LCD Display Frame Removal Procedure on page 8 - 18.

NOTE: The following step may be viewed in the attached movie clip.

4.) Loosen and remove the four screws that fasten the LCD Display to the Rear Cover & Latch Assembly, as shown in shown in Figure 8-178 below.

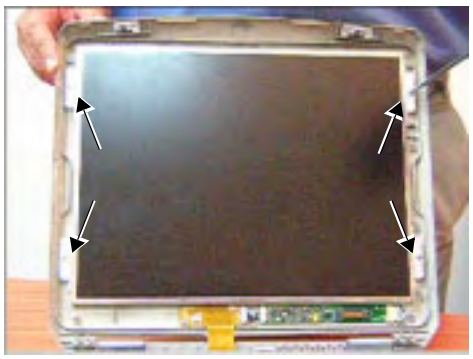


Figure 8-178 Removing the Screws from the LCD Display

NOTE: The following step may be viewed in the attached movie clip.

5.) Use both hands to disconnect the LCD Flex ribbon cable from the BEP, as shown in Figure 8-179 below.

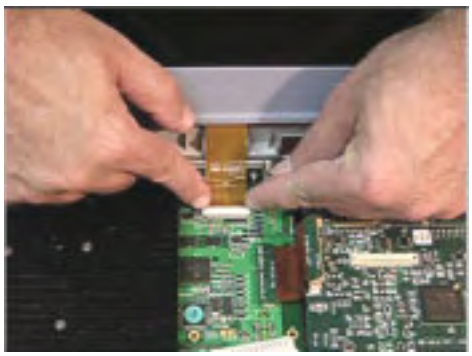


Figure 8-179 Disconnecting the LCD Flex Ribbon Cable

NOTE: On newer, recently-released systems (S/N Vi_000323, and above) a metal bridge is located around the flex cable. In this case, continue from step 6 below; otherwise, proceed to step 9.

6.) Loosen the two Phillips screws and remove the flex cable bridge, as shown in Figure 8-180 below

NOTE: This step may be viewed in the attached movie clip.

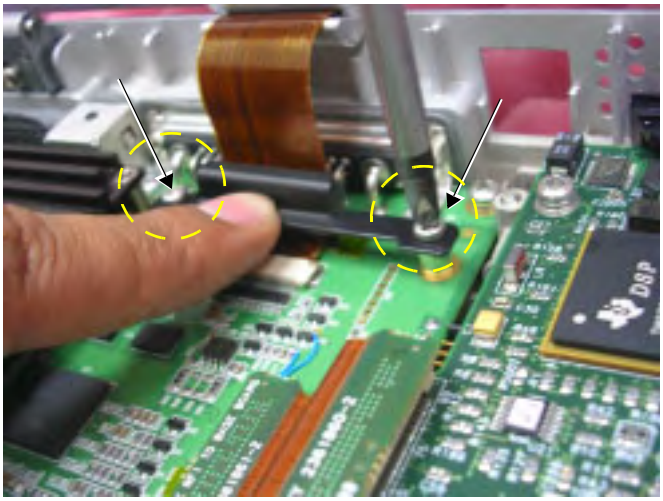


Figure 8-180 Removing the Flex Cable Bridge

7.) Open the two connector latches to disconnect the LCD Flex ribbon cable from BEP - refer to Figure 8-181.

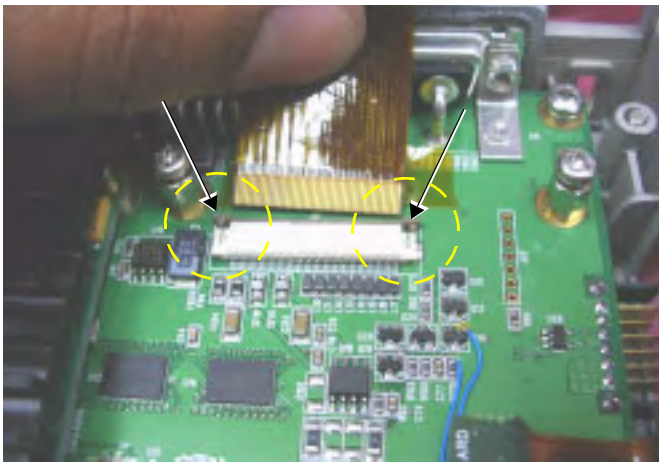


Figure 8-181 Connector Latches

8.) Pull out the flex cover and ferrite, as shown in Figure 8-182.

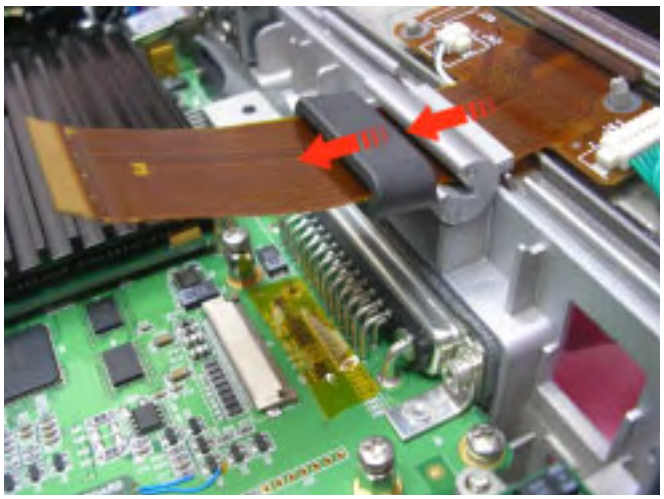


Figure 8-182 Removing Flex Cover and Ferrite

9.) Carefully disconnect the microphone from the LCD Flex.

NOTE: The following step may be viewed in the attached movie clip.

10.) Using both hands, carefully lift the LCD Display upwards and remove it from the Rear Cover & Latch Assembly, as shown in Figure 8-183 below.
Take care not to damage the LCD Flex ribbon cable when performing this step.

Figure 8-183 Removing the LCD Display

8-3-7-5 LCD Display Installation Procedure

NOTE: When performing the following installation procedure steps, it may be helpful to review the appropriate movie clips previously referenced in the LCD Display Removal Procedure.

1) Using both hands, carefully lift the replacement LCD Display into position on the Rear Cover & Latch Assembly (refer to Figure 8-183).
Take care not to damage the LEC Flex ribbon cable when performing this step.

NOTE: On newer, recently-released systems (S/N Vi_000323, and above) a metal bridge is located around the flex cable. In this case, continue from step 2 below; otherwise, proceed to step 5.

2.) Push the flex cover and ferrite back into position, as shown in Figure 8-182 on page 8-37.

3.) Reconnect the LCD Flex ribbon cable to the BEP and close the two connector latches - refer to Figure 8-181 on page 8-37.

4) Return the flex cable bridge and fasten into position with the two Phillips screws (previously removed - refer to Figure 8-180 on page 8-36.

5.) Carefully re-connect the microphone to the LCD Flex.

6) Use both hands to re-connect the LCD Flex ribbon cable to the BEP - refer to Figure 8-179 on page 8-36.

7) Return and fasten the four screws to secure the LCD Display to the Rear Cover & Latch Assembly (refer to Figure 8-178 on page 8-35).

8) Return the LCD Display Frame, as described in the LCD Display Frame Installation Procedure on page 8 - 19.

9) Check that the LCD Display can be tilted *upwards* and *downwards*, and that it holds its set position.

10) Return the Control Panel and Keyboard as described in the Control Panel and Keyboard Installation Procedure on page 8 - 8.

11) Return the bearing handle as described in the Bearing Handle Installation Procedure on page 8 - 2.

12) Boot-up the system into Maintenance Mode.

13) From Windows Explorer, go to the directory: **C:\Marlin\Target\bin** (see Figure 8-184 below).

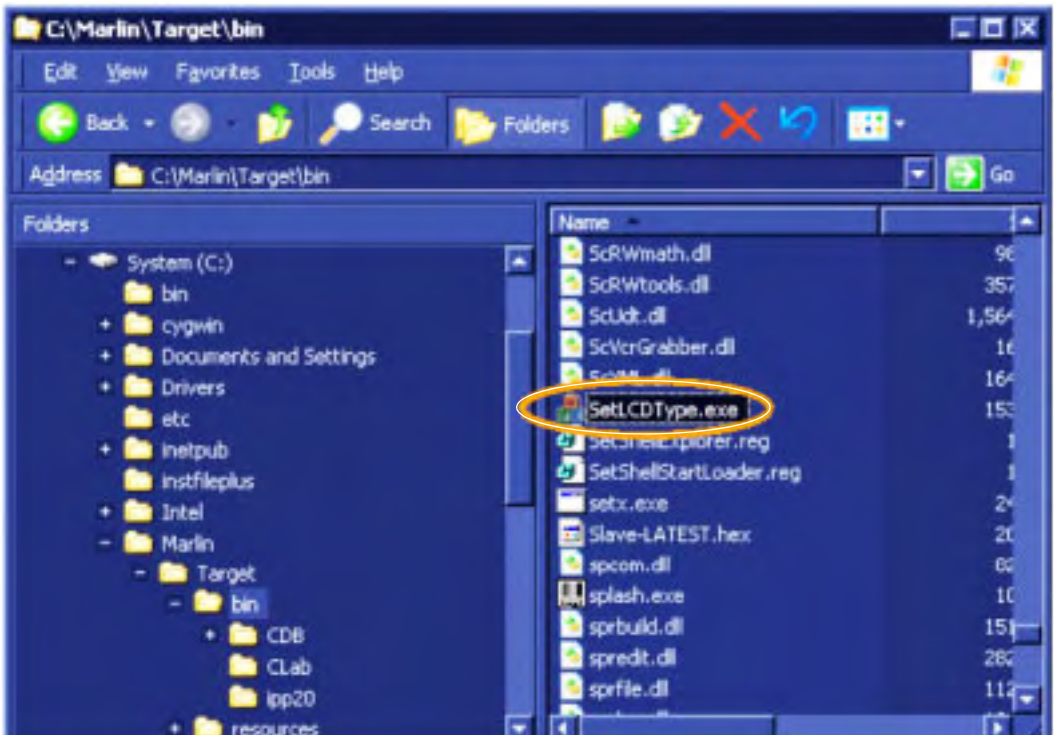


Figure 8-184 Selecting SetLCDType Utility

14.) Double-click on **SetLCDType.exe** to run this utility.

The Set LCD Type dialog opens (Figure 8-185):

Figure 8-185 Set LCD Type Dialog

15) Select the LCD screen type that is installed on the system, as shown in the example below.

Figure 8-186 Selecting LCD Type Installed on the System

16) Click the **Burn** button.

The system is now updated with the new LCD configuration.

17) For the final stage of the LCD Display installation procedure, proceed to calibrate the newly-installed LCD Display by making any adjustments required to the *Brightness*, *Contrast* and/or *Blue Tint,* as described in the LCD Display Adjustments and Calibration on page 6 - 1.

8-3-8 LCD Flex Cable Replacement Procedure

8-3-8-1 Tools

Use the appropriate Phillips and flat screw drivers, as indicated in the LCD Flex Cable replacement procedure.

8-3-8-2 Time Required

15 minutes

8-3-8-3 Preparation

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation*.

8-3-8-4 LCD Flex Cable Removal Procedure

1) Disconnect the AC cable and battery.
2) Remove the Control Panel and Keyboard as described in the Control Panel and Keyboard Removal Procedure on page 8 - 7.
3) Remove the LCD Display Frame as described in the LCD Display Frame Removal Procedure on page 8 - 18.
4) Remove the LCD Display as described in the LCD Display Removal Procedure on page 8 - 35.

NOTE: On newer, recently-released systems (S/N Vi_000323, and above) a metal bridge is located around the flex cable. In this case, continue from step 5 below; otherwise, proceed to step 8.

5.) Loosen the two Phillips screws and remove the flex cable bridge, as shown in Figure 8-180 below.

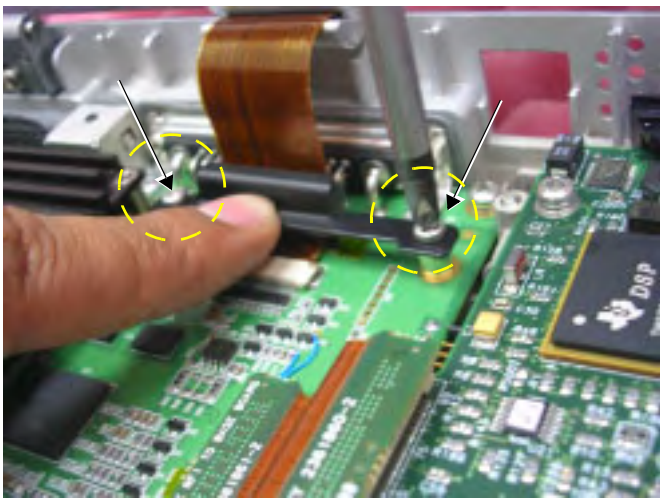


Figure 8-187 Removing the Flex Cable Bridge

6.) Open the two connector latches to disconnect the LCD Flex ribbon cable from BEP - refer to Figure 8-181.

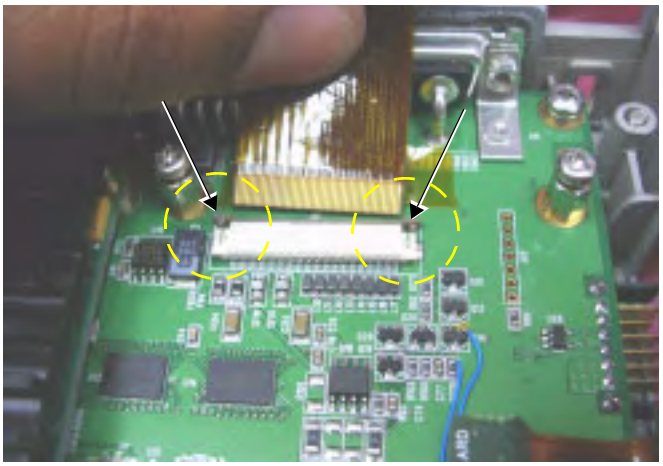


Figure 8-188 Connector Latches

7.) Pull out the flex cover and ferrite, as shown in Figure 8-182.

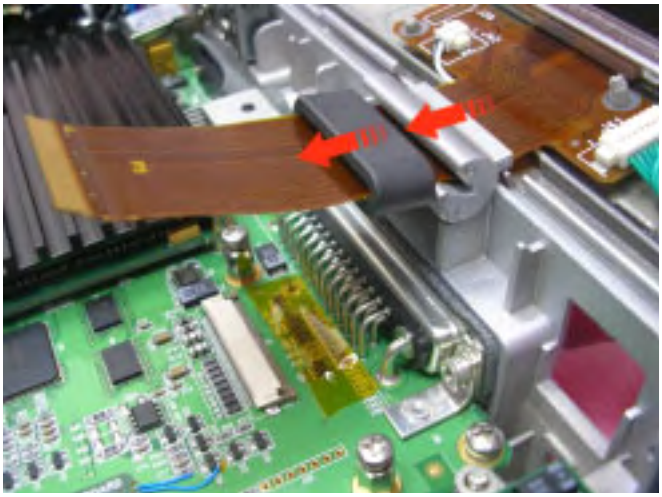


Figure 8-189 Removing Flex Cover and Ferrite

8.) Carefully disconnect the microphone from the LCD Flex.

9) Using both hands, carefully lift the LCD Display upwards and remove it from the Rear Cover & Latch Assembly, as shown in Figure 8-190.

Figure 8-190 Removing the LCD Display

NOTE: Take care not to damage the LCD Flex ribbon cable when performing this step.

Flex Cable Replacement Procedure

1) Remove the kapton tape from the LCD rear panel and disconnect the flex cable - see Figure 8-191.

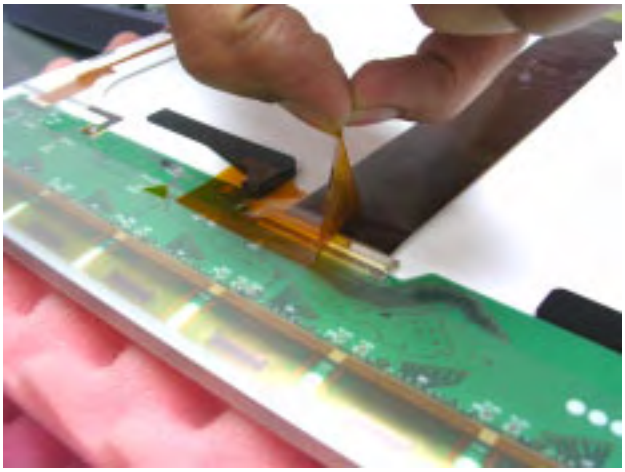


Figure 8-191 Removing Tape from LCD Rear Panel

2) Connect the new flex cable to LCD rear panel connector, as shown in Figure 8-192.

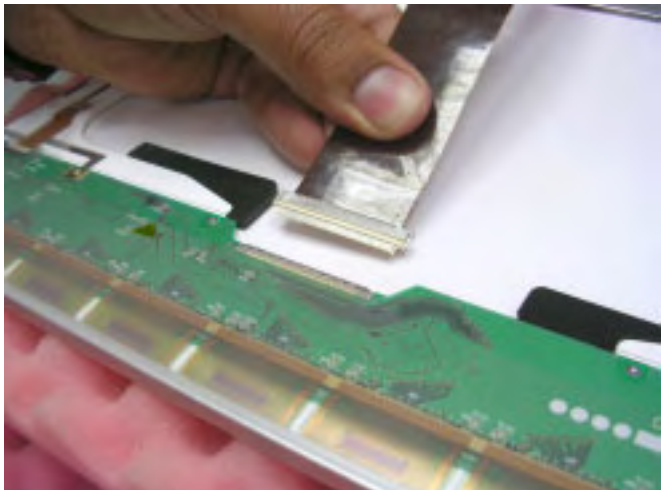


Figure 8-192 Connecting the Flex Cable to the LCD Rear Panel

3) Connect the flex cable to the LCD rear panel connector.

4) Adhere the kapton tape on the LCD rear panel connector, see Figure 8-193.

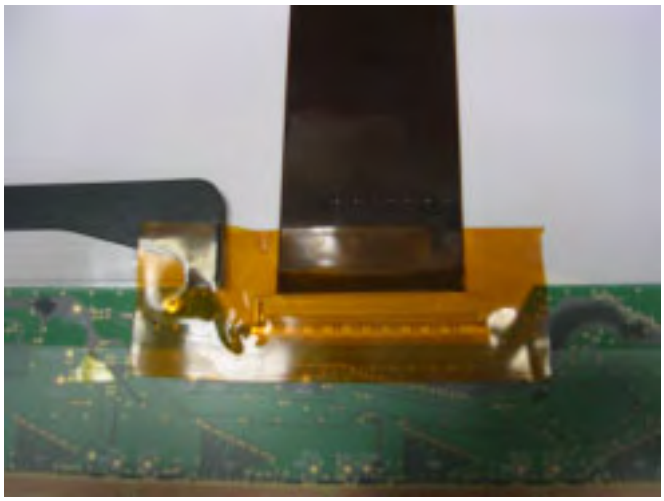


Figure 8-193 Adhering Kapton Tape on the LCD Rear Panel Connector

5) Using both hands, carefully lift the LCD Display upwards and install it back to the Rear Cover & Latch Assembly, see Figure 8-190 on page 8-43.

6) Thread the new flex cover and ferrite to the flex cable - see Figure 8-189 on page 8-42.

7) Connect the flex cable to the BEP and close the two latches - see Figure 8-188 on page 8-42.

8) If necessary, re-install the flex cable bridge and tighten the two Phillips screws (refer to Figure 8-187 on page 8-41).

9) Return the LCD Display as described in the LCD Display Installation Procedure on page 8 - 38.

10) Return the LCD Display Frame, as described in the LCD Display Frame Installation Procedure on page 8 - 19.

11) Check that the LCD Display can be tilted upwards and downwards, and that it holds its set position.

12) Return the Control Panel and Keyboard as described in the Control Panel and Keyboard Installation Procedure on page 8 - 8.

8-3-9 Microphone Assembly Replacement Procedure

NOTE: This section describes the replacement procedure for the Microphone Assembly which is supplied as part of the LCD Panel Kit - Part No. 2410809.

8-3-9-1 Tools

None required.

8-3-9-2 Time Required

10 minutes

8-3-9-3 Preparation

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation*.

8-3-9-4 Microphone Assembly Removal Procedure

1) Remove the LCD Display Frame as described in the LCD Display Frame Removal Procedure on page 8 - 18.

NOTE: The following steps may be viewed in the attached movie clip.

2) Carefully unclip and release the microphone from the *upper right* side of the LCD display, as shown in Figure 8-194 below.

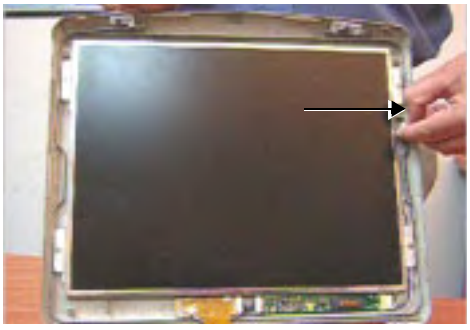


Figure 8-194 Releasing the Microphone

3) Release the microphone cable from its seating in the cable groove that runs along the side and bottom of the LCD Display.

Note: An adhesive rubber channel is fitted inside the groove to hold the cable in place.

4.) Disconnect the miniature plug from the cable connector below the LCD Display as shown in Figure 8-195.

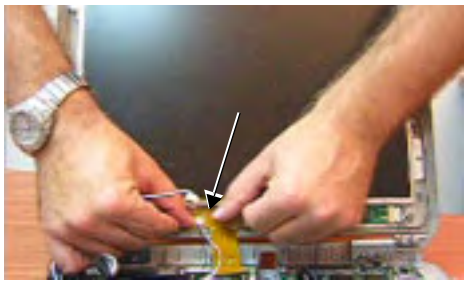


Figure 8-195 Disconnecting the Miniature Plug

5.) Remove the Microphone Assembly from the system.

8-3-9-5 Microphone Assembly Installation Procedure

NOTE: When performing the following installation procedure steps, it may be helpful to review the appropriate movie clip previously referenced in the Microphone Assembly Removal Procedure.

1) Using the replacement Microphone Assembly, re-connect the miniature plug to the cable connector below the LCD Display (refer to Figure 8-195 on page 8-46).

2) Feed the microphone cable into the cable groove that runs along the side and bottom of the LCD Display.

Note: An adhesive rubber channel is fitted inside the groove to hold the cable in place.

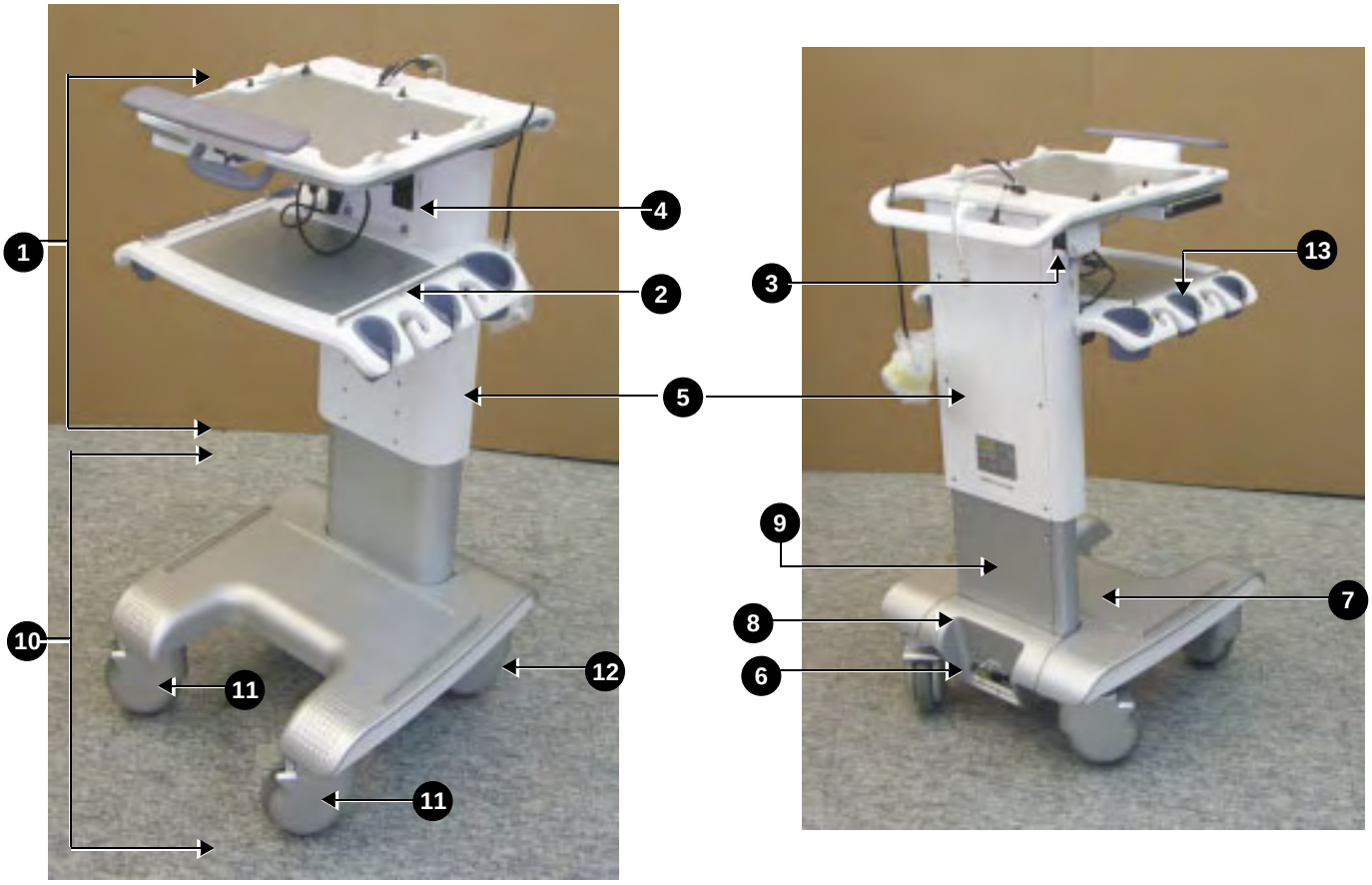
3) Clip the microphone into position, making sure it is properly seated on the *upper right* side of the LCD Display (refer to Figure 8-194 on page 8-46).

4) Return the LCD Display Frame as described in the LCD Display Frame Installation Procedure on page 8 - 19.

5.) Perform a functional test of the microphone, as described in *Chapter 4 - Functional Checks*.

Section 8-4
SafeLock Cart Components Replacement

8-4-1 Overview of SafeLock Cart Replaceable Components



Note: Basket not visible in pictures

Figure 8-196 Vivid-i™ SafeLock Cart Components

Table 8-2 Vivid-i™ SafeLock Cart Components (Figure 8-196)

Label	Item	Label	Item
1	Top Shelf Assembly (with handle)	8	Bottom Cover - Rear
2	Probe Shelf (with probe holders)	9	Rear Lower Cover
3	LAN Isolation Box	10	SafeLock Cart Bottom Assembly
4	USB Audio Assembly	11	Front Wheels (with locking lever)
5	Rear Upper Cover	12	Rear Wheels
6	AC Distribution Assembly (behind cover)	13	Pencil Probe Holder (choose required socket)
7	Bottom Cover - Front		

8-4-1-1 Warnings and Cautions

DANGER: Electrical hazards exist at several points in the system. Familiarize yourself with all hazardous voltages and high current levels before removing any of the covers.

DANGER: DO NOT wear the ESD wrist band strap when removing parts from the power supply unit. Before removing any part of the power unit, turn the power OFF and disconnect the power cord.

CAUTION: Before removing circuit boards, turn the power OFF and wear the ESD wrist band strap.

8-4-1-2 Overview of Procedures

For quick reference, the SafeLock Cart component replacement procedures are described in the following sub-sections:

- Top Shelf and Bottom Assembly- see page 8-50.
- Handrest - see page 8-52.
- Probe Shelf Assembly - see page 8-53.
- Pencil Probe Holder - see page 8-54.
- Basket - see page 8-55.
- USB Box - see page 8-56.
- Upper Cover (Rear) - see page 8-59.
- Lower Cover (Rear) - see page 8-60
- Front Wheels - see page 8-61
- Rear Wheels - see page 8-63
- AC Distribution Assembly - see page 8-65.
- Main Harness Cable - see page 8-68.

8-4-2 Top Shelf and Bottom Assembly Replacement Procedures

8-4-2-1 Tools

Use the appropriate Phillips-type screw drivers, Allen key and open wrench, as indicated in the Top Shelf and Bottom Assembly replacement procedure.

8-4-2-2 Preparations

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation*.

8-4-2-3 Top Shelf and Bottom Assembly Removal Procedure

1) Disconnect the AC adapter and all cables from the Vivid-i™ portable ultrasound scanner.
2) Disconnect and remove all peripherals from the SafeLock Cart.
3) Remove the Upper Cover (Rear) as described in the Upper Cover (Rear) Removal Procedure on page 8 - 59.
4) Remove the Lower Cover (Rear) as described in the Lower Cover (Rear) Removal Procedure on page 8 - 60.
5.) Remove the USB Box as described in the USB Box Removal Procedure on page 8 - 56.
6.) Using an open wrench, carefully release the nut located between the gas spring and the release handle - see Figure 8-197. Turn the nut in a *clockwise* direction until you are able to rotate the gas spring central shaft sufficiently to release the gas spring from the up/down handle mechanism.

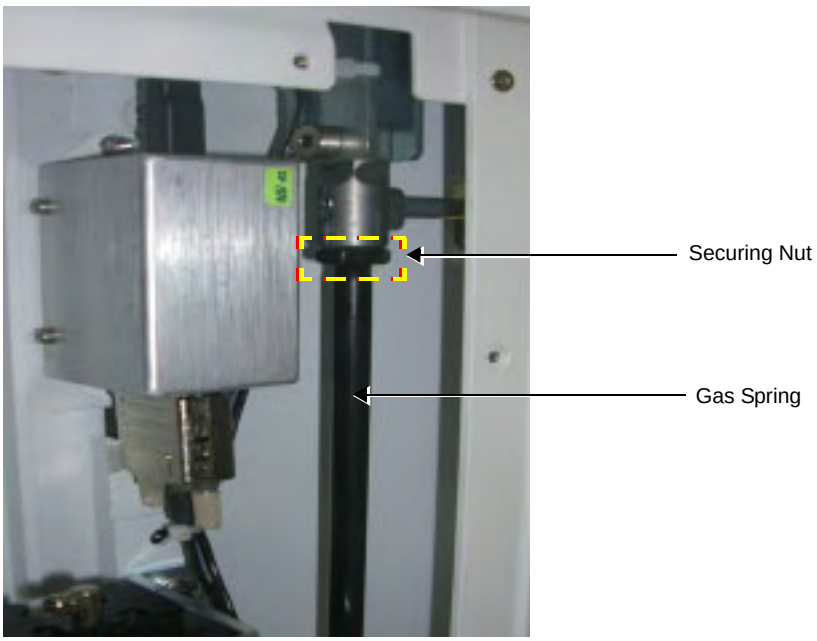


Figure 8-197 Gas Spring and Securing Nut

7.) Disconnect the two cables (P1 cable and peripherals power cable) from the top of the AC Input Assembly as described in AC Distribution Assembly Removal Procedure on page 8 - 65 (refer to step 6 and step 7).
8.) Remove any cable ties holding the above cables in position.
9.) Carefully lie the system on its side.
10.) Loosen and remove the four large nuts beside the linear guide (two on each side) as shown in Figure 8-198 below.

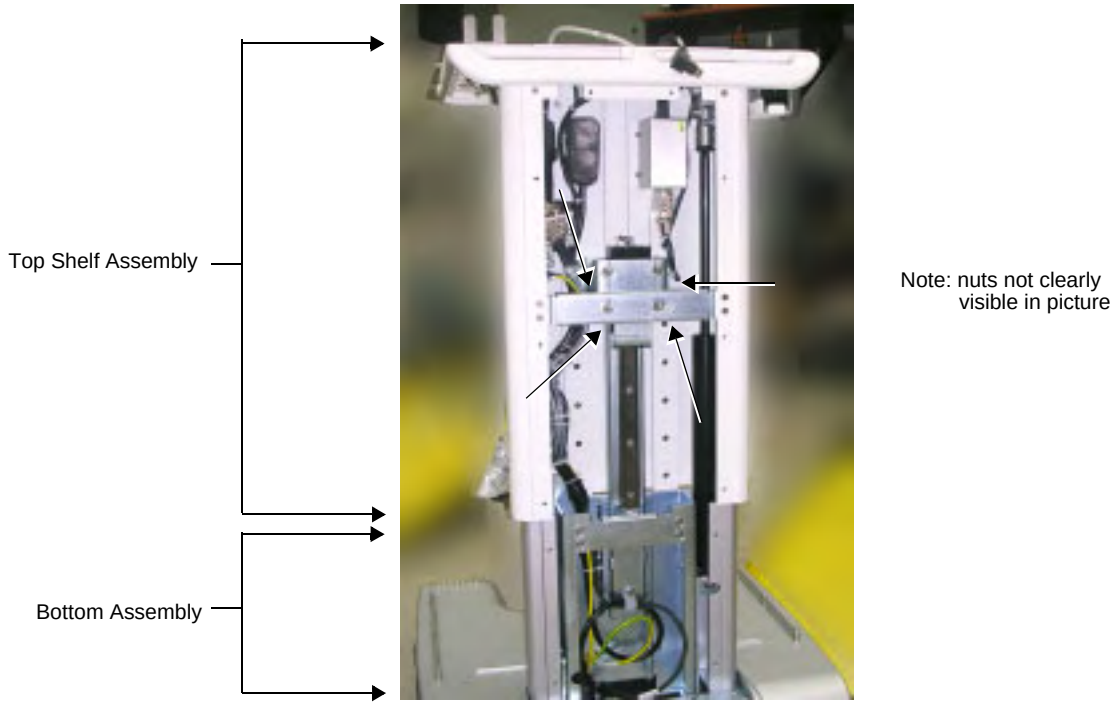


Figure 8-198 Top Shelf and Bottom Assembly - Viewed from Rear

11.) Carefully slide the top shelf assembly up and away from the center column section to remove it from the Bottom Assembly.

8-4-2-4 Top Shelf and Bottom Assembly Installation Procedure

1) Working with the replacement parts lying on their side, carefully slide the top shelf assembly down and into the center column section to attach it to the Bottom Assembly.

2) Return and fasten the four large nuts beside the linear guide (two on each side) as shown in Figure 8-198, above.

3) Carefully stand the SafeLock Cart upright.

4.) Reconnect the two cables (P1 cable and peripherals power cable) from the top of the AC Input Assembly as described in AC Distribution Assembly Installation Procedure on page 8 - 67 (refer to step 4 and step 5).

5.) Fasten the above cables in position using new cable ties.

6) Using an open wrench, carefully tighten the nut located between the gas spring and the release handle - see Figure 8-197 as follows:
Rotate the gas spring central shaft sufficiently to fasten the gas spring and up/down handle mechanism. Turn the nut in a *counter-clockwise* direction until fastened securely.

7.) Return the USB Box as described in the USB Box Installation Procedure on page 8 - 58.

8) Return the Lower Cover (Rear) as described in the Lower Cover (Rear) Installation Procedure on page 8 - 60.

9) Return the Upper Cover (Rear) as described in the Upper Cover (Rear) Installation Procedure on page 8 - 59.

10) Return and reconnect all required peripherals to the SafeLock Cart.

11) Reconnect the AC adapter and all cables to the Vivid-i™ portable ultrasound scanner.

8-4-3 Handrest Replacement Procedure

NOTE: If required, the main shelf handrest may be replaced separately, as described below.

8-4-3-1 Tools

Use the appropriate Phillips-type screw drivers, as indicated in the handrail replacement procedure.

8-4-3-2 Preparations

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation*.

8-4-3-3 Handrail Removal Procedure

1) Remove all peripherals from the Vivid-i™ portable ultrasound scanner.
2) Working from the *front* of the SafeLock Cart and underneath the main shelf, loosen and remove the three screws that secure the handrest to the main shelf - see Figure 8-199 below.

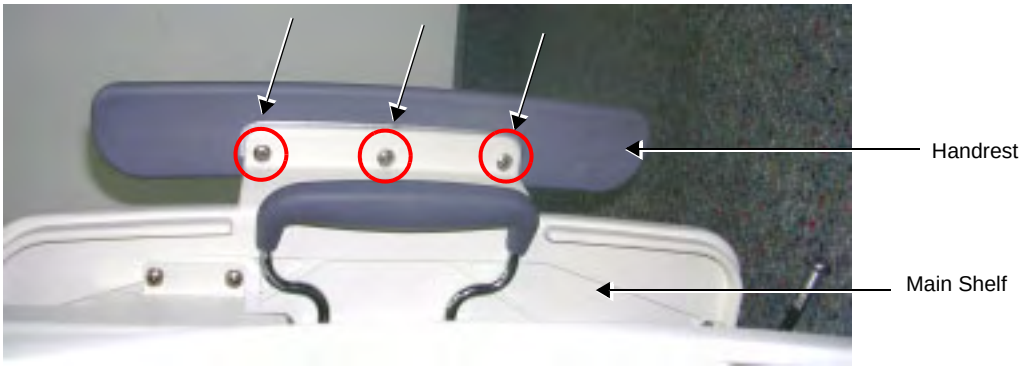


Figure 8-199 Handrest Secured to Main Shelf (viewed from below)

3.) Remove the handrest.

8-4-3-4 Handrest Installation Procedure

1) Return a replacement handrest to the SafeLock Cart main shelf, making sure the three screw holes are aligned correctly.
2) Return and fasten the three screws (previously removed) to secure the handrest in position.

8-4-4 Probe Shelf Assembly Replacement Procedures

NOTE: The probe holders and rails are an integral part of the probe shelf assembly; with the exception of the pencil probe holder, these components may not be replaced separately. If required, refer to Pencil Probe Holder Replacement Procedures on page 8 - 54.

8-4-4-1 Tools

Use the appropriate Allen key, as indicated in the probe shelf assembly replacement procedure.

8-4-4-2 Preparations

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation*.

8-4-4-3 Probe Shelf Assembly Removal Procedure

1) Remove all peripherals from the Vivid-i™ portable ultrasound scanner.
2) Working from the *front* of the SafeLock Cart and underneath the probe shelf assembly, loosen and remove the two lower screws (one on either side), that secure the shelf in position.
3) ***While supporting the shelf with one hand***, loosen and remove the two upper screws (one on either side - see Figure 8-200 below); remove the shelf.

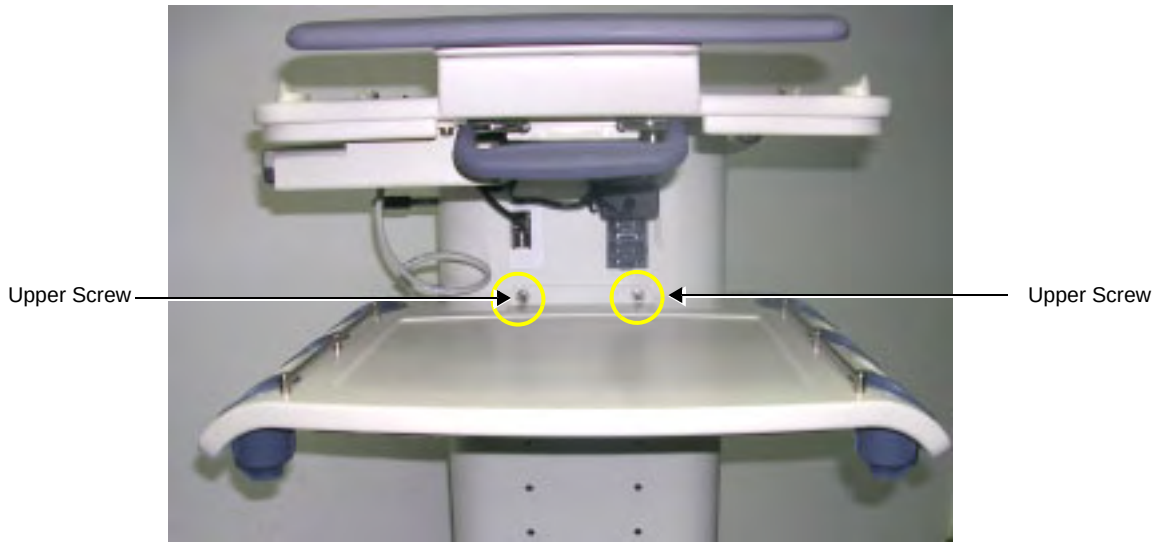


Figure 8-200 Probe Shelf Assembly - Upper Securing Screws

8-4-4-4 Probe Shelf Assembly Installation Procedure

1) Return the secondary shelf to the required position on the SafeLock Cart.
2) ***While supporting the shelf with one hand***, return and fasten the two upper screws (one on either side) previously removed.
3) Return and fasten the two lower screws (one on either side), making sure that the shelf is firmly secured in position.
4) Place the required peripheral on the probe shelf assembly.
5) Re-connect all peripherals to the Vivid-i™ portable ultrasound scanner.

8-4-5 Pencil Probe Holder Replacement Procedures

8-4-5-1 Tools

None.

8-4-5-2 Preparations

None

8-4-5-3 Pencil Probe Holder Removal Procedure

1) Working from the side of the SafeLock Cart, remove the pencil probe holder from its location in the probe holder socket on the side of the Probe Shelf Assembly by pulling it *upwards* to free it from its fixed position.
2) If necessary, using your hand, tap it gently from underneath to release it - refer to Figure 8-201 below.

8-4-5-4 Pencil Probe Holder Installation Procedure

1) Insert the replacement pencil probe holder into the required probe holder socket on the side of the Probe Shelf Assembly - see Figure 8-201 below.
2) Push *downwards* until the holder is firmly seated in position.

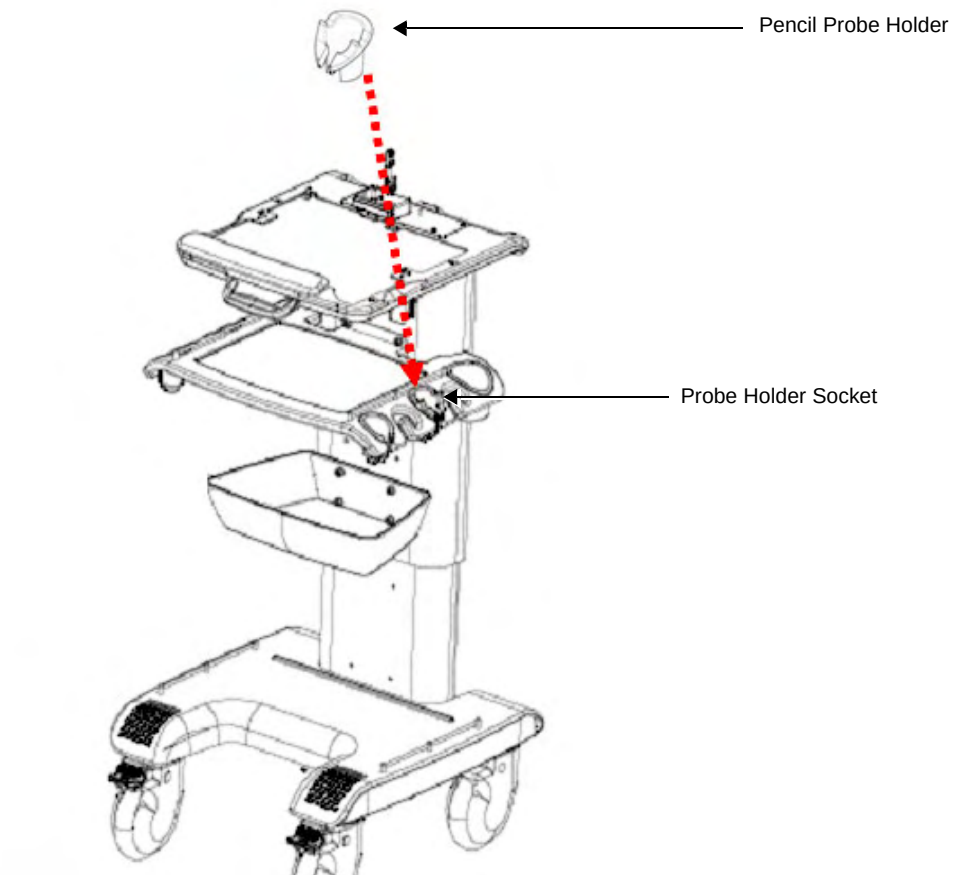


Figure 8-201 Pencil Probe Holder Installation on Probe Shelf Assembly

8-4-6 Basket Replacement Procedures

8-4-6-1 Tools

Use the appropriate flat and Phillips-type screw drivers as indicated in the Basket replacement procedure.

8-4-6-2 Preparations

None.

8-4-6-3 Basket Removal Procedure

1) Working from the front of the SafeLock Cart, unscrew and remove the four screws and washers that secure the basket and metal fastening plate to the SafeLock Cart main column - refer to Figure 8-201 below. While performing this step, use one hand to support the parts from underneath.

2) Remove the basket and fastening plate from the SafeLock Cart.

8-4-6-4 Basket Installation Procedure

3) Working from the front of the SafeLock Cart, place the basket and fastening plate at the required height on the SafeLock Cart main column, carefully aligning the four screw holes on the parts with the four screw holes on the column - see illustration on the left in Figure 8-201 below.

4.) Return the four screws and washers (previously removed), passing them through the holes in the basket and fastening plate.

5.) Tighten the screws until the basket is firmly secured in position on the column, as shown below.

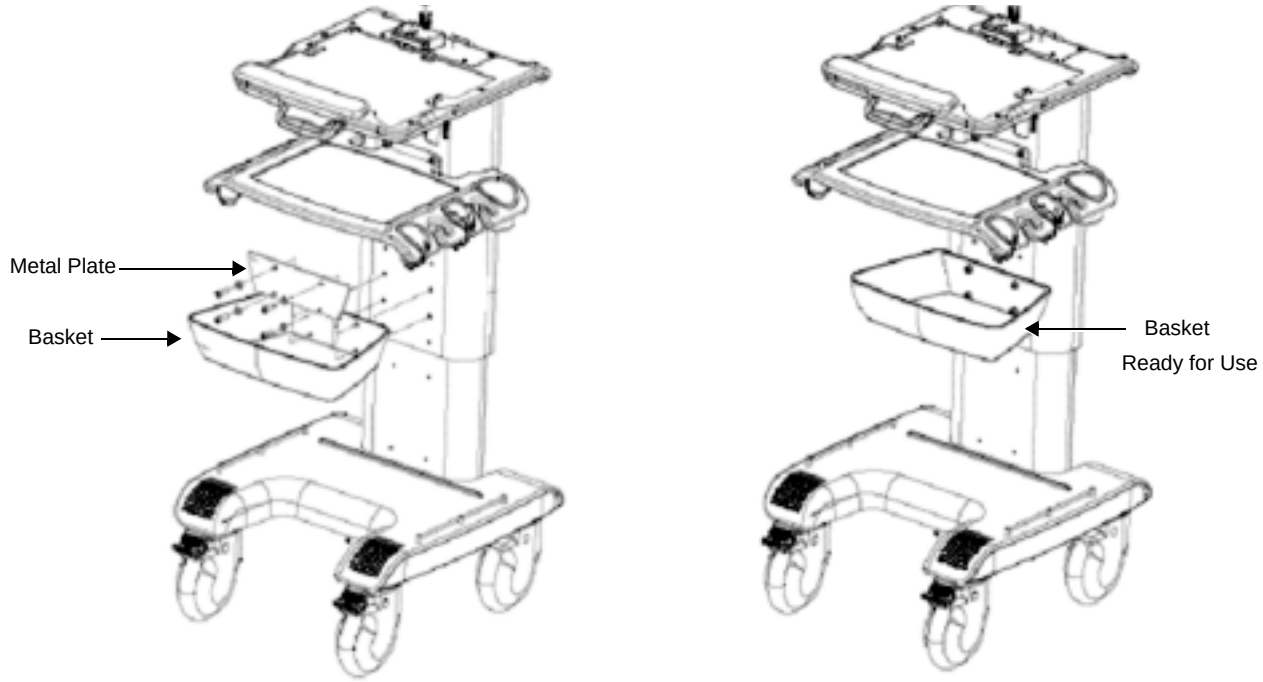


Figure 8-202 Basket Installation on SafeLock Cart

The basket is now ready for general-purpose storage of the required items.

8-4-7 USB Box Replacement Procedure

8-4-7-1 Tools

Use the appropriate flat and Phillips-type screw drivers and a wire cutter as indicated in the USB Box replacement procedure.

8-4-7-2 Preparation

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation.*

8-4-7-3 USB Box Removal Procedure

1) Turn OFF power to the SafeLock Cart and disconnect the AC power cable from the AC input assembly at the base of the cart (rear).
2) Remove the Upper Cover (Rear), as described in the Upper Cover (Rear) Removal Procedure on page 8 - 59.
3) Remove the cover (metal plate) from the USB box by carefully pulling it out towards you, as shown in Figure 8-205 below.

Figure 8-203 Removing the USB Box Cover

4) Disconnect the USB connector, as shown in Figure 8-204 below.

Figure 8-204 Disconnecting the USB Connector

5.) Remove the two (upper and lower) screws that hold the USB Box to the upper frame, as shown in Figure 8-205 below.

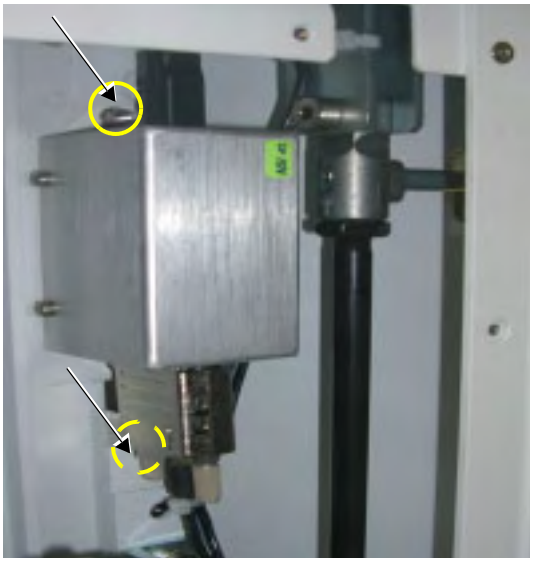


Figure 8-205 Removing the USB Box Securing Screws

6) Disconnect the 5V power cable from the top of the USB Box, as shown in Figure 8-206 below.

Figure 8-206 Disconnecting the 5V Power Cable

7.) Remove the USB Box from the SafeLock Cart.

8-4-7-4 USB Box Installation Procedure

1) Return the replacement USB box to the correct position on the SafeLock Cart chassis and secure in position with the upper and lower screws (previously removed - see Figure 8-205 on page 8-57).

2.) Re-connect the 5V power cable to the top of the USB Box, as shown in Figure 8-206, above. Make sure the pins are properly aligned and do not force the cable into position.

3) Return the Upper Cover (Rear), as described in the Upper Cover (Rear) Installation Procedure on page 8 - 59.

4) Reconnect the AC power cable to the AC input assembly at the base of the cart (rear) and turn ON power to the SafeLock Cart.

8-4-8 Upper Cover (Rear) Replacement Procedures

8-4-8-1 Tools

Use the appropriate Phillips-type screw drivers, as indicated in the upper cover (rear) replacement procedure.

8-4-8-2 Preparations

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation*.

8-4-8-3 Upper Cover (Rear) Removal Procedure

1) Loosen and remove the four screws on the *left* side of the upper rear cover (see Figure 8-207).

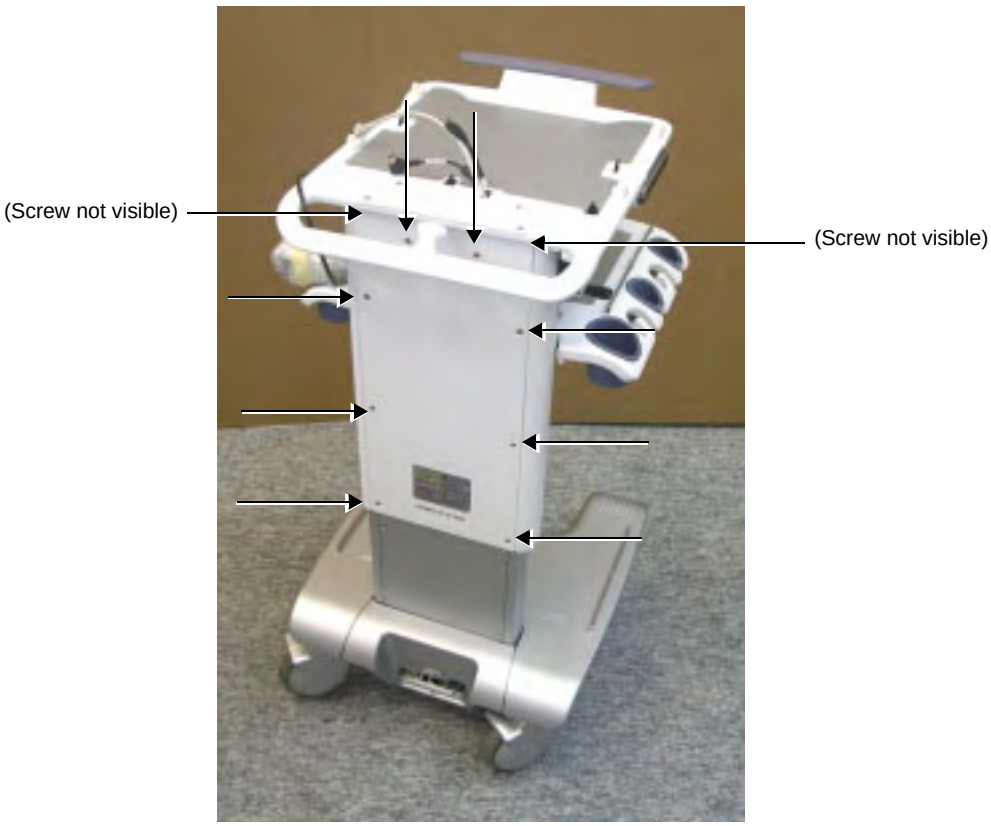


Figure 8-207 Upper Cover (Rear) Removal

2) Loosen and remove the four screws on the *right* side of the upper cover (rear).

3.) While holding the cover to prevent it from falling, loosen and remove the two upper screws (see Figure 8-207).

4.) Remove the cover.

8-4-8-4 Upper Cover (Rear) Installation Procedure

5.) Return the cover to the correct position on the rear of the SafeLock Cart (see Figure 8-207).

6.) While holding the cover to prevent it from falling, return and fasten the two upper screws (see Figure 8-207).

7) Return and fasten the four screws on the *left* side of the upper cover (rear).

8) Return and fasten the four screws on the *right* side of the upper cover (rear).

8-4-9 Lower Cover (Rear) Replacement Procedures

8-4-9-1 Tools

Use the appropriate Phillips-type screw drivers, as indicated in the lower cover (rear) replacement procedure.

8-4-9-2 Preparations

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation*.

8-4-9-3 Lower Cover (Rear) Removal Procedure

1) Loosen and remove the two screws on the *left* side of the lower rear cover (see Figure 8-208).
2) While holding the cover to prevent it from falling, loosen and remove the two screws on the *right* side of the lower cover (rear).

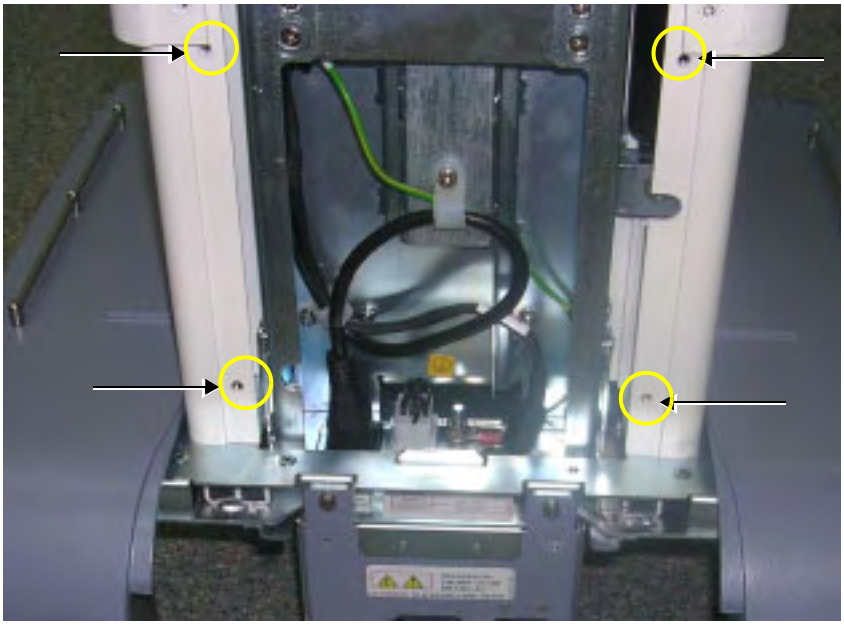


Figure 8-208 Lower Cover (Rear) Removal

3.) Remove the cover.

8-4-9-4 Lower Cover (Rear) Installation Procedure

4.) Return the cover to the correct position on the rear of the SafeLock Cart (see Figure 8-208).
5) While holding the cover to prevent it from falling, return and fasten the two screws on the *right* side of the lower cover (rear).
6) Return and fasten the two screws on the *left* side of the upper cover (rear).

8-4-10 Front Wheel Replacement Procedures

NOTE: This section describes the replacement procedure for a Front Wheel. (The brake on each front wheel is an integral part of the wheel).

NOTE: Both or only one front wheel may be replaced, as required.

8-4-10-1 Tools

Use the appropriate flat screw driver and wrench, as indicated in the front wheel replacement procedure.

8-4-10-2 Preparations

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation*.

8-4-10-3 Front Wheel Removal Procedure

1) Disconnect mains power from the AC adapter.
2) Disconnect the AC adapter and all cables and peripherals from the Vivid-i™ portable ultrasound scanner.
3) Remove the Vivid-i™ and all peripherals from the SafeLock Cart.
4.) Carefully lay the SafeLock Cart on its back.

Note: only 2 bolts visible in picture

Figure 8-209 Front Wheel Bolted to SafeLock Cart Chassis

5) Loosen and remove the four bolts that secure the front wheel to the SafeLock Cart chassis (see Figure 8-209, above).
6.) Remove the wheel from the SafeLock Cart.

8-4-10-4 Front Wheel Installation Procedure

1) Install the new front wheel on the SafeLock Cart chassis in the same position as that of the previously-removed wheel. Make sure it is correctly positioned, parallel to the other front wheel.

2.) Return and fasten the four bolts (previously removed - refer to Figure 8-209) and make sure that wheel is secured firmly to the chassis.

3) Loosen and remove the four bolts that secure the front wheel to the SafeLock Cart chassis (see Figure 8-209, above).

4.) Stand the SafeLock Cart upright.

5) Return the Vivid-i™ and all peripherals to their appropriate positions on the SafeLock Cart.

6) Re-connect the AC adapter and all cables and peripherals to the Vivid-i™ portable ultrasound scanner.

7) Re-connect mains power to the AC adapter.

8-4-11 Rear Wheel Replacement Procedure

NOTE: This section describes the replacement procedure for a Rear Wheel. Both or only one rear wheel may be replaced, as required.

8-4-11-1 Tools

Use the appropriate flat screw driver and wrench, as indicated in the rear wheel replacement procedure.

8-4-11-2 Preparations

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation*.

8-4-11-3 Rear Wheel Removal Procedure

1) Disconnect mains power from the AC adapter.
2) Disconnect the AC adapter and all cables and peripherals from the Vivid-i™ portable ultrasound scanner.
3) Remove the Vivid-i™ and all peripherals from the SafeLock Cart.
4.) Carefully lay the SafeLock Cart on its side.

Note: only 2 bolts visible in picture

Figure 8-210 Rear Wheel Bolted to SafeLock Cart Chassis

5) Loosen and remove the four bolts that secure the rear wheel to the SafeLock Cart chassis (refer to Figure 8-210, above).
6.) Remove the wheel from the SafeLock Cart.

8-4-11-4 Rear Wheel Installation Procedure

1) Install the new rear wheel on the SafeLock Cart chassis in the same position as that of the previously-removed wheel. Make sure it is correctly positioned, parallel to the other rear wheel.

2.) Return and fasten the four bolts (previously removed - refer to Figure 8-209 on page 8-61) and make sure that wheel is secured firmly to the chassis.

3) Loosen and remove the four bolts that secure the rear wheel to the SafeLock Cart chassis.

4.) Stand the SafeLock Cart upright.

5) Return the Vivid-i™ and all peripherals to their appropriate positions on the SafeLock Cart.

6) Re-connect the AC adapter and all cables and peripherals to the Vivid-i™ portable ultrasound scanner.

7) Re-connect mains power to the AC adapter.

8-4-12 AC Distribution Assembly Replacement Procedure

8-4-12-1 Tools

Use the appropriate flat and Phillips-type screw drivers and a wire cutter as indicated in the AC Distribution Assembly replacement procedure.

8-4-12-2 Preparation

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation.*

8-4-12-3 AC Distribution Assembly Removal Procedure

1) Turn OFF power to the SafeLock Cart and disconnect the AC power cable from the AC input assembly at the base of the cart (rear).
2.) Remove the Upper Cover (Rear), as described in the Upper Cover (Rear) Removal Procedure on page 8 - 59.
3.) Remove the Lower Cover (Rear), as described in the Lower Cover (Rear) Removal Procedure on page 8 - 60.
4.) Remove the Bottom Cover (Rear) - loosen and remove the three screws.

The AC Distribution Assembly is now exposed, as shown in Figure 8-211 below.

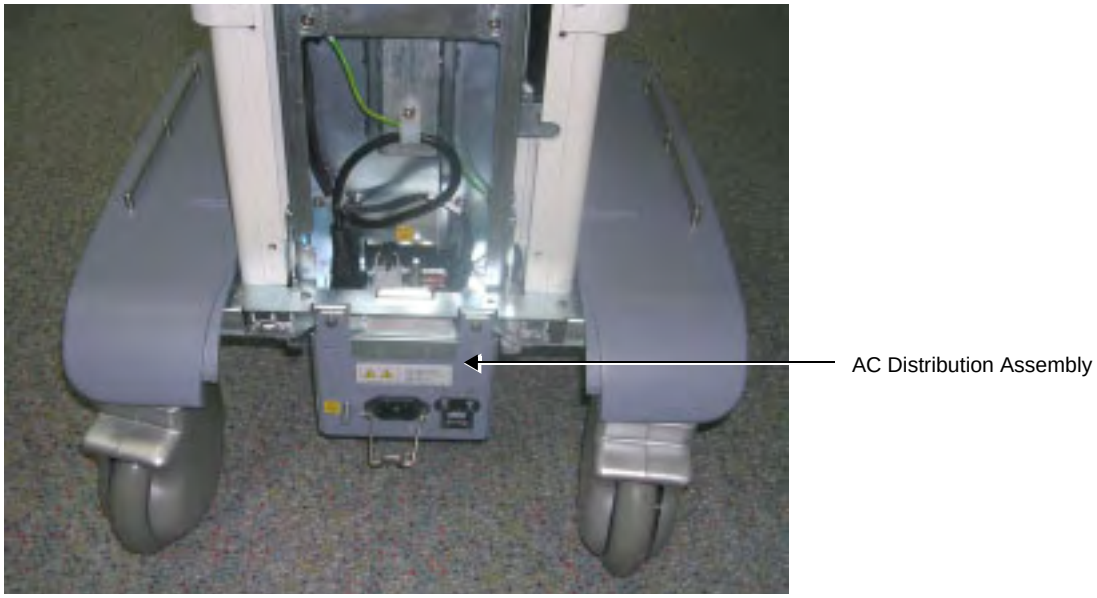


Figure 8-211 AC Distribution Assembly and Mounting Bracket

5.) Cut all cable ties holding the cables in position.
6.) Unscrew the metal cable fastener from the P1 cable (on the *right*) and remove the cable from its socket - refer to Figure 8-212 below.
7.) Disconnect the peripherals power cable (PN 2409513 - on the *left*) from the AC Distribution Assembly - refer to Figure 8-212 below.
8.) Loosen and remove the Ground screw fastened to the AC Distribution Assembly - refer to Figure 8-211 below.
9.) Remove the Jumper from the top of the AC Distribution Assembly (press the plastic side lugs in to facilitate removal) - refer to Figure 8-212 below.

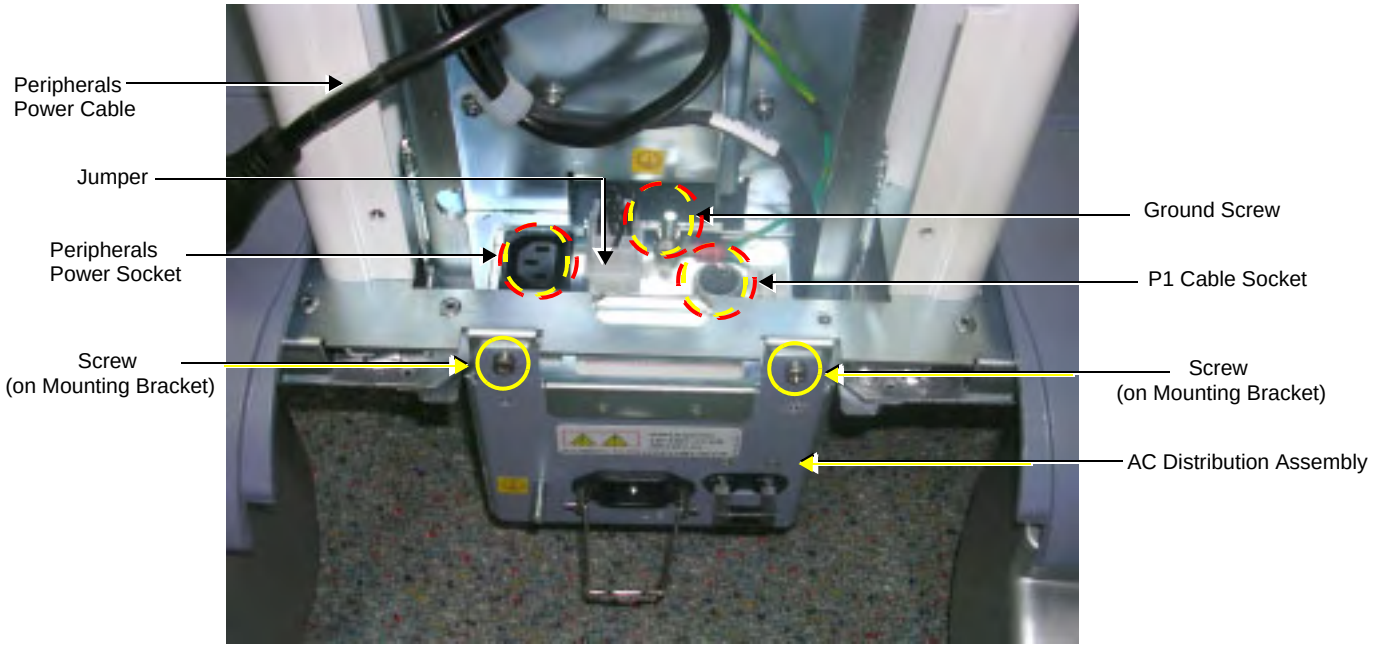


Figure 8-212 AC Distribution Assembly and Cable Sockets

10.) Loosen and remove the two screws that secure the AC Distribution Assembly to the mounting bracket on the SafeLock Cart chassis - see Figure 8-213 below.

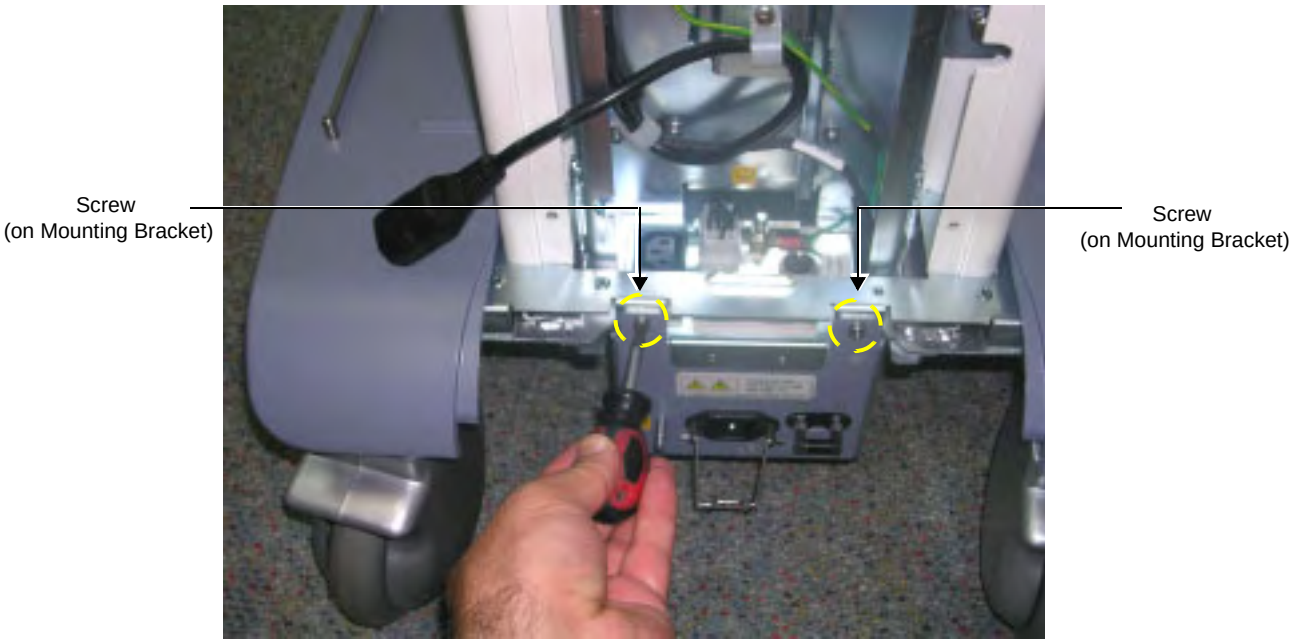


Figure 8-213 Removing AC Distribution Assembly from Mounting Bracket

11.) Carefully pull the AC Distribution Assembly out towards you and remove it by sliding it away remove from the SafeLock Cart, as shown in Figure 8-214 below.

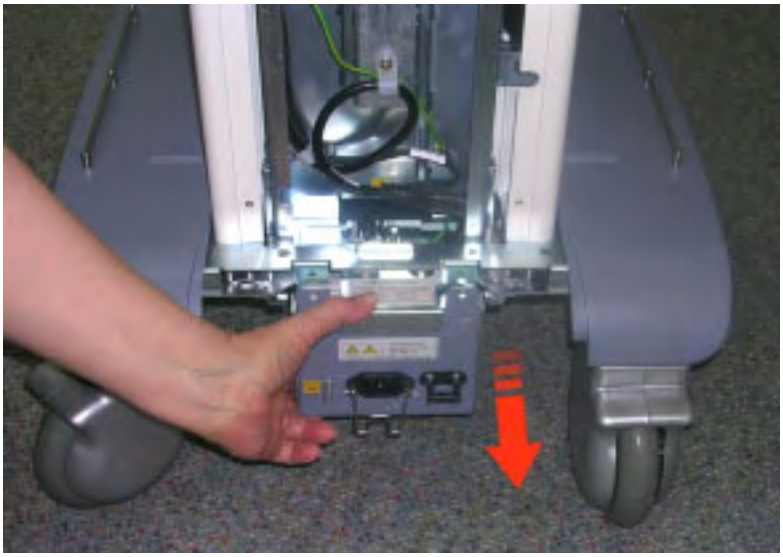


Figure 8-214 Removing the AC Distribution Assembly from the SafeLock Cart

8-4-12-4 AC Distribution Assembly Installation Procedure

1) Return the replacement AC Distribution Assembly to the correct position on the SafeLock Cart chassis and secure in position on the mounting bracket using the two screws (previously removed - see Figure 8-214 on page 8-67).
2.) Re-connect the Jumper - refer to Figure 8-212, above.
3.) Return and fasten the Ground screw to the AC Distribution Assembly - refer to Figure 8-212, above.
4.) Reconnect the peripherals power cable (PN 2409513 - on the *left*) to the AC Distribution Assembly - refer to Figure 8-212, above.
5.) Reconnect the P1 cable to the socket (on the *right*) and screw in position with the metal cable fastener - refer to Figure 8-212, above.
6.) Secure all cables in position with new cable ties.
7.) Return the Bottom Cover (Rear), and fasten the three screws (previously removed).
8.) Return the Lower Cover (Rear), as described in the Lower Cover (Rear) Installation Procedure on page 8 - 60.
9.) Return the Upper Cover (Rear), as described in the Upper Cover (Rear) Installation Procedure on page 8 - 59.
10.) Reconnect the AC power cable to the AC Distribution Assembly at the base of the cart (rear) and turn ON power to the SafeLock Cart.

8-4-13 Main Harness Cable Replacement Procedure

NOTE: This section describes the replacement procedure for the Main Harness Cable Kit (P/N 2418913), illustrated below.

Figure 8-215 Main Harness Cable

As shown in Figure 8-215, above, the Main Harness Cable has a P1 Connector at one end (connects to the AC Distribution Box); the other end has three separate connectors, used for the following (and replacing the previous supply to the system):

- 20V power supply to the Vivid-i™ scanner (docking connector)
- DVD power supply (J1)
- 5V power supply to USB Hub (J6)

8-4-13-1 Tools

Use the appropriate flat and Phillips-type screw drivers and a wire cutter as indicated in the Main Harness Cable replacement procedure.

8-4-13-2 Preparation

Shut down the Vivid-i™ ultrasound unit, as described in *Chapter 3 - Installation (complete power down).*

8-4-13-3 Main Harness Cable Removal Procedure

1) Turn OFF power to the SafeLock Cart and disconnect the AC power cable from the AC input assembly at the base of the cart (rear).

2.) Remove the Upper Cover (Rear), as described in the Upper Cover (Rear) Removal Procedure on page 8 - 59.

3.) Unscrew and remove the four screws and cover plate from the rear of the top shelf (upper surface) to expose the cables underneath, as shown in Figure 8-216 below.

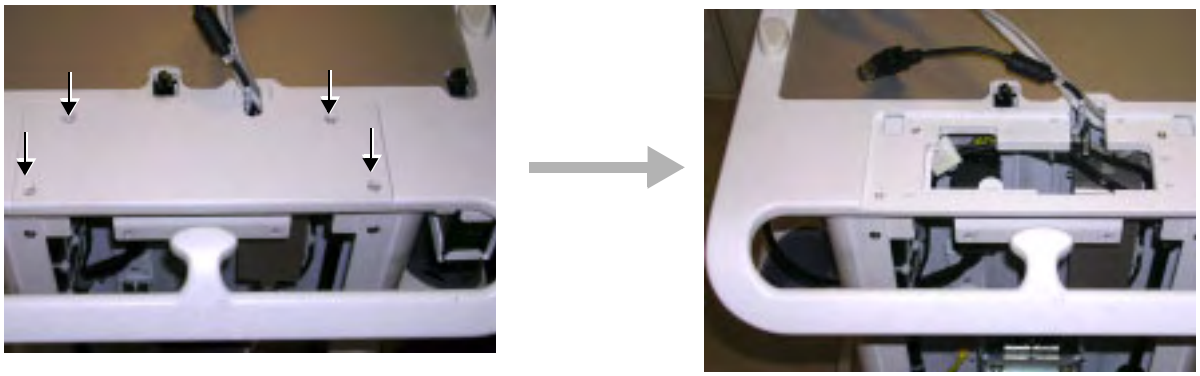


Figure 8-216 Cover Plate Removed from Top Shelf

4.) Remove the Lower Cover (Rear) from the SafeLock Cart, as described in the Lower Cover (Rear) Removal Procedure on page 8 - 60.

5.) Disconnect the P1 connector from the AC Distribution Box - see Figure 8-217 on page 8-69.

Figure 8-217 P1 Connector Disconnected from AC Distribution Box

6.) Cut all the relevant cable ties and loosen the screw/nut on the two nylon cable fasteners (see Figure 8-218) to enable freeing of the cables.

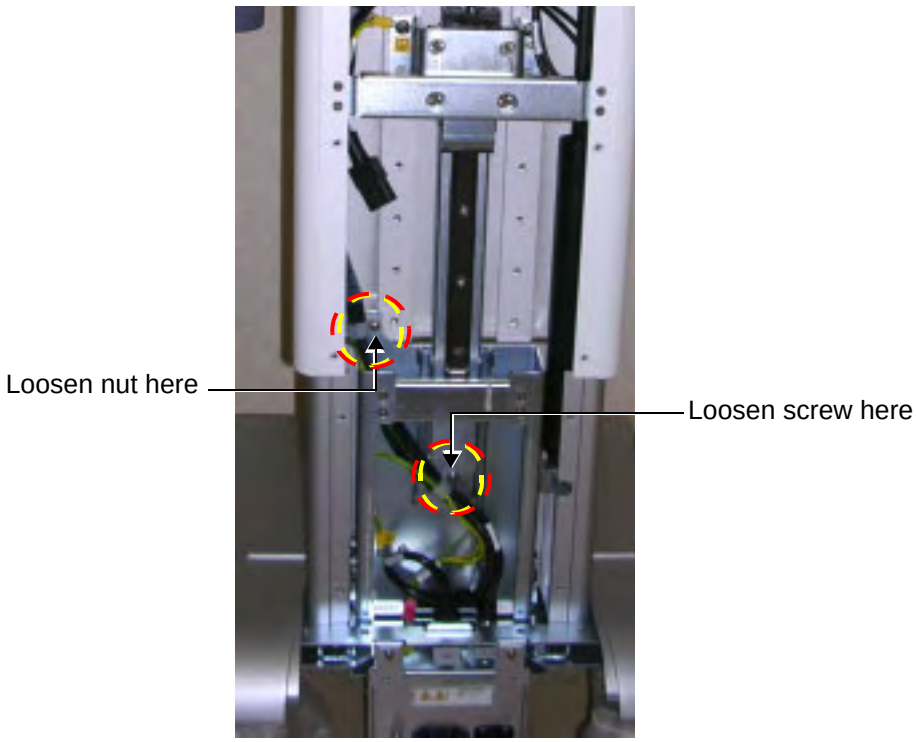


Figure 8-218 Loosening Nylon Cable Fasteners

NOTE: Loosening of the screw securing the Ground cable may also be necessary (Figure 8-219 on page 8-70).

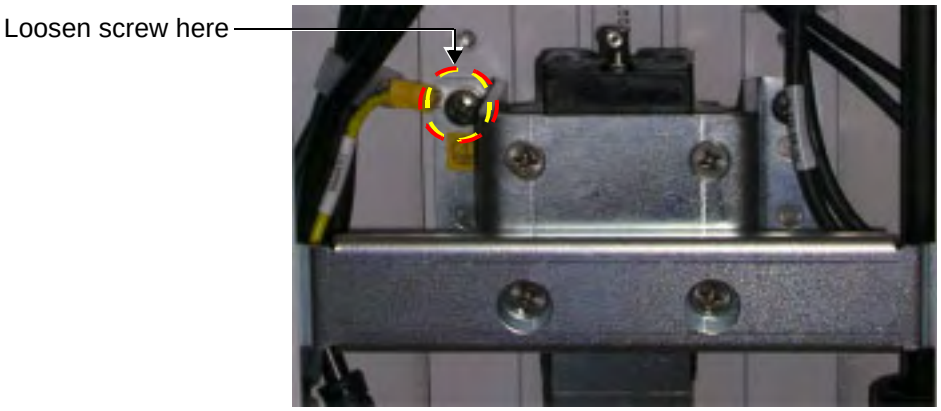


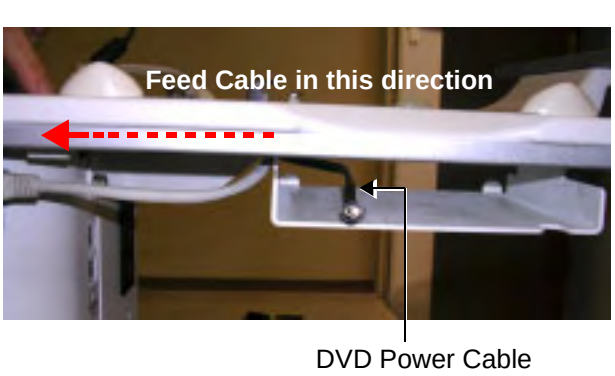
Figure 8-219 Loosening Ground Cable Screw

7) Loosen the knurled screws and disconnect the USB connector (P6) from the USB hub (as shown in Figure 8-220 below) and pull the cable downwards and remove it from the Cart.

Figure 8-220 Disconnecting USB Connector

8.) Remove the 20V power supply cable from the Cart.

9.) Carefully feed the DVD power cable *backwards* and *downwards* through the hole in the rear of the upper shelf and over the top of the USB Hub to remove it from the Cart (refer to Figure 8-221).



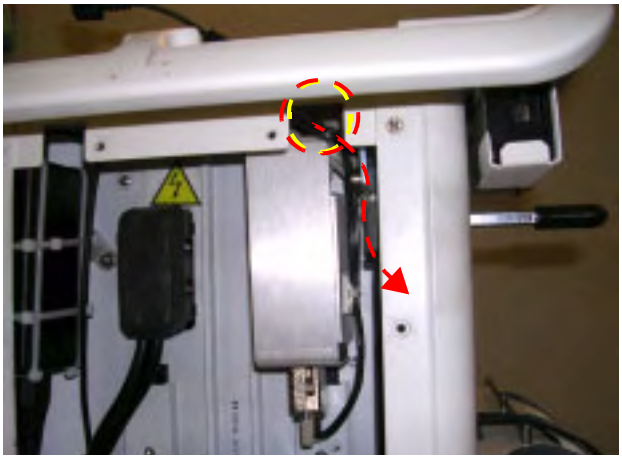


Figure 8-221 Removing DVD Power Cable

8-4-13-4 Main Harness Cable Installation Procedure

1.) Place the new Main Harness Cable roughly into position at the rear of the SafeLock Cart, feeding it place behind the cross ribs of the Cart main assembly.

2.) Holding the new Main Harness Cable in one hand, feed the Docking Connector up into position on the rear of the SafeLock Cart and lay it on top of the upper shelf (see Figure 8-222 below). (Now it is ready for connection to the Vivid-i™ scanner later as shown in Figure 8-225 on page 8-73).

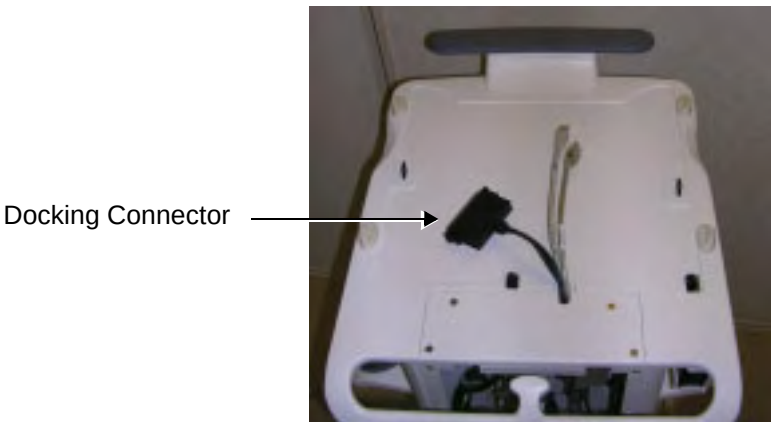


Figure 8-222 Docking Connector Laying on Top Shelf

3.) Carefully feed the DVD connector *upwards* over the top of the USB Hub and *forwards* through the hole in the rear of the upper shelf (Figure 8-223), then plug the connector into the DVD.

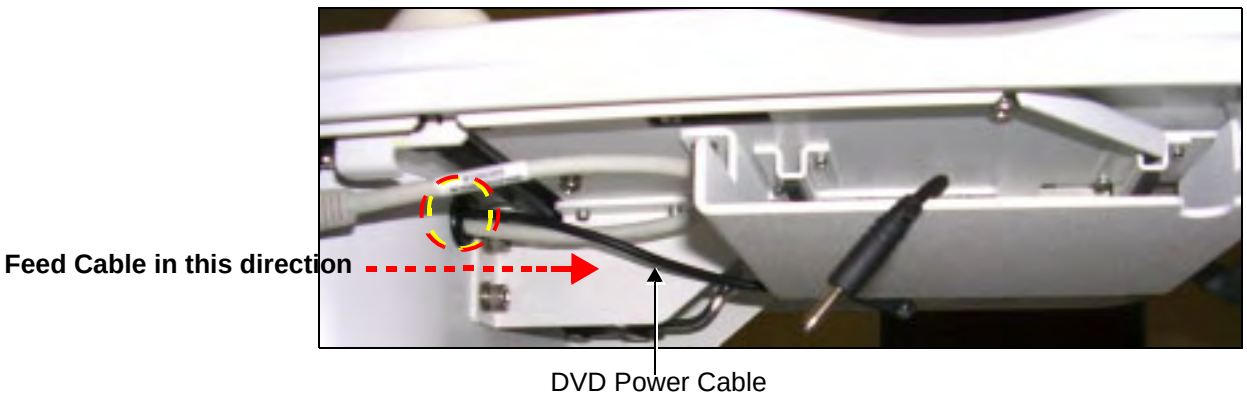


Figure 8-223 Positioning the DVD Power Cable

4) Carefully feed the USB cable into position and connect the USB connector (P6) to the USB hub tightening the knurled screws to secure it firmly (refer to Figure 8-220 on page 8-71).

5.) Using cable ties, fasten all branches of the new Main Harness Cable firmly in position, **allowing sufficient slack to accommodate the *up\down* movement of the SafeLock Cart.** Tighten the screw/nut on the two nylon cable fasteners (previously loosened - see Figure 8-218 on page 8-70).

6.) If previously loosened, tighten the screw to secure the Ground cable in position.

7.) Connect the P1 connector on the new Main Harness Cable to the AC Distribution Box and secure the cable firmly with cable ties, as shown in Figure 8-224 below.

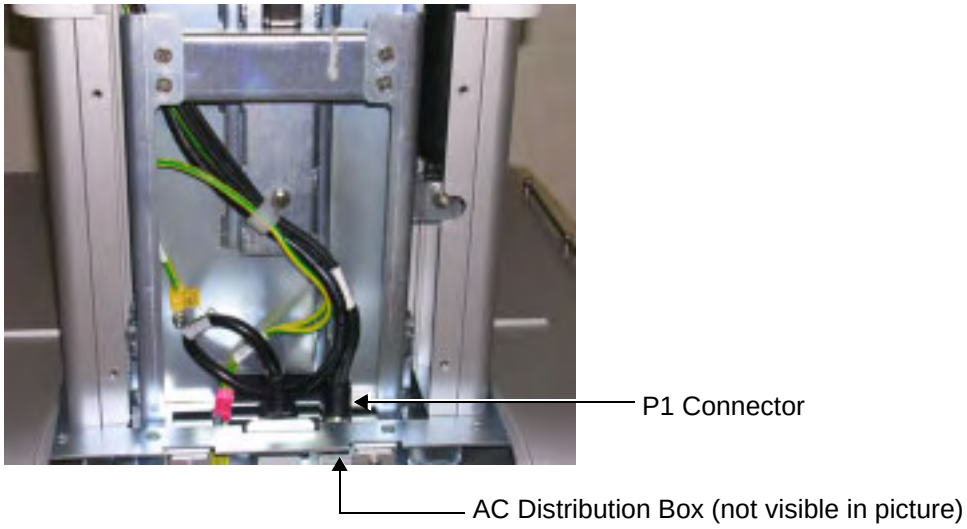


Figure 8-224 New Main Harness Cable in Position on SafeLock Cart

8.) Return the Lower Cover (Rear), as described in the Lower Cover (Rear) Installation Procedure on page 8 - 60.

9.) Return the Upper Cover (Rear), as described in the Upper Cover (Rear) Installation Procedure on page 8 - 59.

10.) Return and fasten the four screws and cover plate to the rear of the top shelf (upper surface), as shown in Figure 8-216 on page 8-69.

11.) Mount the Vivid-i™ scanner on the SafeLock Cart , as described in Mounting the Vivid-i™ on the SafeLock Cart (optional) on page 3 - 56.

12.) Connect the Docking Connector (see Figure 8-225 below) LAN and USB connectors to the rear of the scanner and turn ON power to the system.

Note: Refer also to Figure 8-215 on page 8-68.

Figure 8-225 Connecting the Docking Connector to the Rear of Scanner

13.) From *Normal Scanning* mode, check that the system is operating correctly and also that the DVD is working properly.

Section 8-5
Software Loading

8-5-1 Software Installation/Upgrade Procedure Overview

NOTE: If you are upgrading the system software from version 4.x.x to 6.x.x, it may be necessary to contact your local OTR department to receive an appropriate software password. Make sure you specify the system serial number located on the base of the Vivid-i™ unit.

NOTE: It is recommended to back-up the archive and the settings as described in the Vivid-i™ User Manual, before commencing software installation (or whenever upgrading the software).

WARNING: Do not attempt to install software that was not designated for your Vivid-i™ unit. Attempting to install un-approved software will cause irreversible damage to hardware and software!

Refer to the following sub-sections, as appropriate:

- Setting the BIOS on page 8 - 81
- BIOS Firmware Update on page 8 - 83
- Formatting and Partitioning the Hard Disk - Automatic Procedure on page 8 - 86
- Formatting and Partitioning the Hard Disk - Manual Procedure on page 8 - 87
- Full Re-ghost and Software Installation on page 8 - 91
- Installing Software only from DVD on page 8 - 93
- Installing Software only or Patch on page 8 - 97
- Installation of PMC Version on page 8 - 98

Normally the Vivid-i™ system is supplied from the manufacturer with the software already installed. In some cases, it is necessary to re-install the software (for example, after replacing the Back-end Processor) by following the software re-installation procedure shown in Table 8-3 on page 8-75.

Note: If this is a first installation, format the hard disk as described in Formatting and Partitioning the Hard Disk - Manual Procedure on page 8 - 87. When done, perform the software installation procedure described below.

Table 8-3 Software Re-Installation/Upgrade

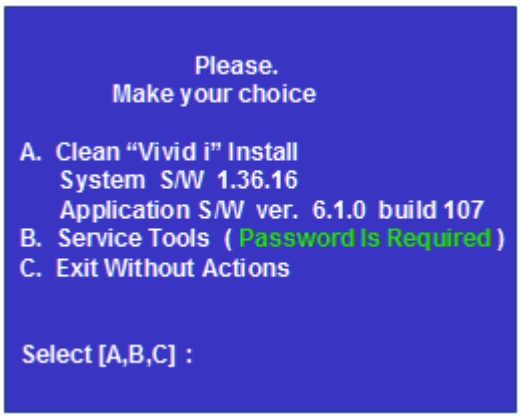
Step	Instruction	Expected Result
1	Eject the battery and remove all peripherals currently connected to the system, with the following exceptions: Make sure no peripherals are connected to the USB connectors except the DVD and the PCMCIA.	
2	Press the <Eject> button of the DVD\CD-RW drive and remove any media if present.	The DVD\CD-RW drive tray ejects.
3	Insert the CD provided with the software kit, and press the <Eject> button again.	The DVD\CD-RW drive tray will load the software CD.
4	Hold down the <ON/OFF> button for 5 seconds to shutdown the system.	The shutdown options are displayed on-screen.
5	Select **Full Shutdown**.	The system powers down.
6	Hold down the <ON/OFF> button for three seconds.	The system powers ON and when system boot-up from the CD is complete, the following message is displayed prompting you to select the required option:
7	Select option 1. **Vivid_i Full Clean Install (System + Application Software**)	Wait until the following message is displayed, prompting you to select the required option: 
8	Select option A. **Clean "Vivid i" Install System S/W ...**	The user is prompted for a password.

Table 8-3 Software Re-Installation/Upgrade (Continued)

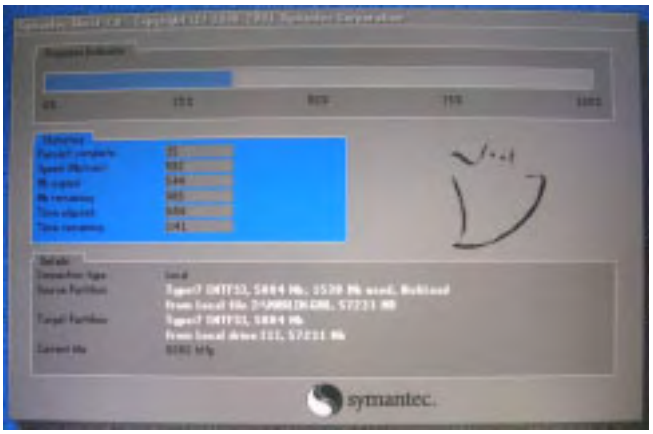
Step	Instruction	Expected Result
9	When prompted, type the following password: **geulsservice** and press <**Enter**>. Note: when typing the password, use lower-case letters.	A message is displayed showing the current system ID. The CD then begins the software installation process and a progress indicator is displayed, as shown below:  This stage of the process takes approximately 5 mins. A message is then displayed on-screen prompting you to press <Eject> and remove the CD, then to press <CTRL + ALT + DELETE> to reboot the system.
10	Press <Eject> and remove the CD. Press <CTRL+ALT+DELETE>.	The system re-boots.
11	Follow the on-screen instructions, clicking OK (or Cancel) when prompted.	The machine performs 4 reboots before completing the installation. The installation process will take approximately 15 minutes - ***DO NOT ATTEMPT TO STOP THE INSTALLATION BEFORE COMPLETION!*** During this time, the following screens will be displayed (in the order shown):

Table 8-3 Software Re-Installation/Upgrade (Continued)

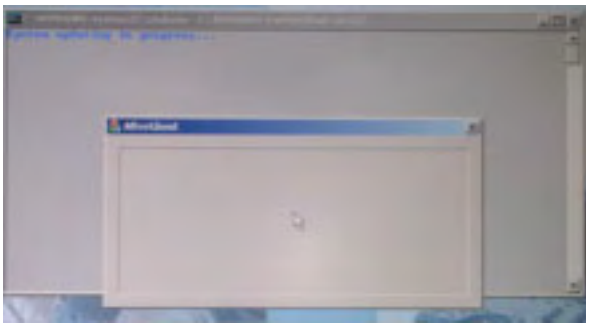
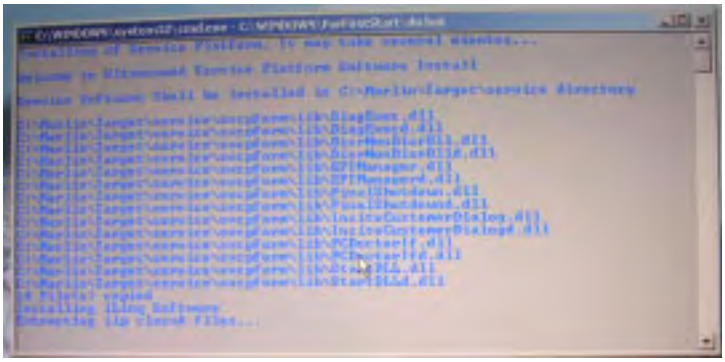
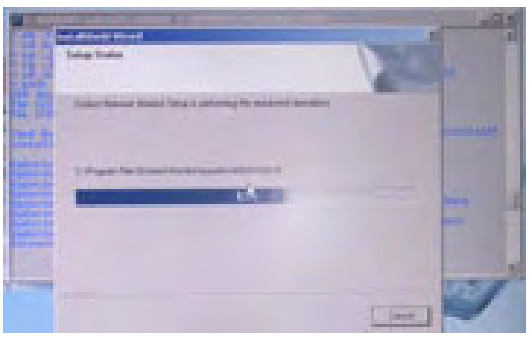
Step	Instruction	Expected Result
11cont'd		Cont'd.... the following screens will be displayed (in the order shown): 
		GSP Installation (approx 5 mins):  : 

Table 8-3 Software Re-Installation/Upgrade (Continued)

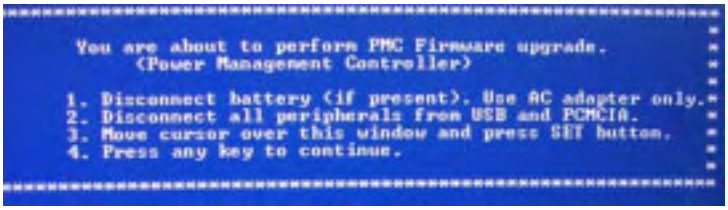
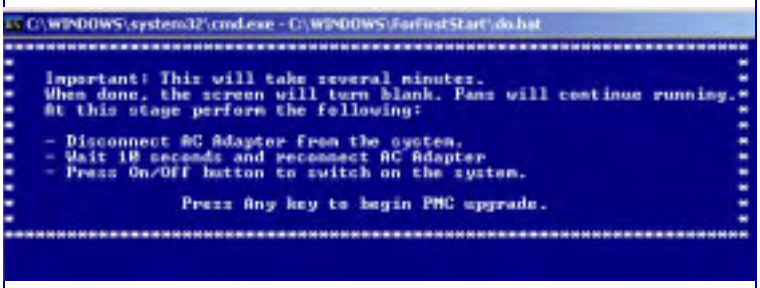
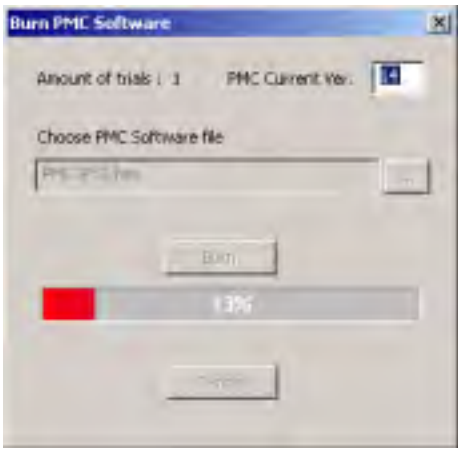
Step	Instruction	Expected Result
11cont'd		When done, the following PMC Firmware upgrade message is displayed: 
12	Make sure the battery is disconnected. Disconnect all peripherals from the USB and PCMCIA. Move cursor over the displayed window and press the SET button.	The following message is displayed 
13	Press any key to begin the PMC upgrade.	The PMC upgrade commences and the following screen with current PMC version and colored progress bar is displayed:  Note: If this screen fails to appear, refer to Installation of PMC Version on page 8 - 98. When done (after several minutes), the screen will turn blank and the fans will continue running.

Table 8-3 Software Re-Installation/Upgrade (Continued)

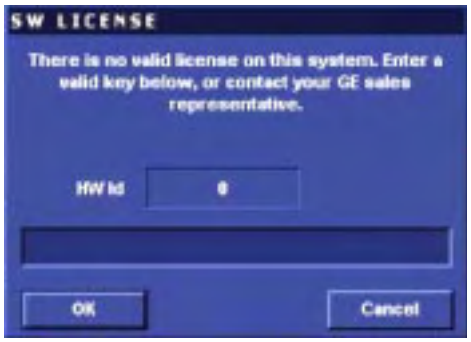
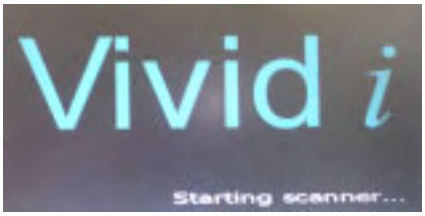
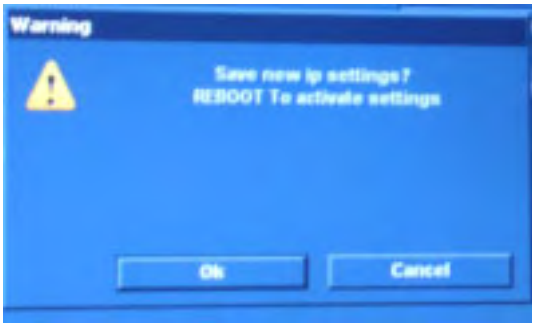
Step	Instruction	Expected Result
14	Power down the system by removing the AC adapter from the rear of the system. Wait 10 seconds, then re-connect the battery and the AC adapter. Boot-up the system by pressing the On/Off button.	If this is a new installation, the system will prompt for the software licence Password, as shown below. Proceed to Step 15.  If not a new installation, there is no prompt for the software licence Password and the boot-up screen is displayed (see below). Proceed to Step 16.
15	Type the password provided for the specific software and approve by clicking **OK**.	The system will continue to boot-up into *Normal Scanning* mode: 
16	From the System Configuration window, click the **Connectivity** tab at the bottom of the window.	The Connectivity dialog box opens.
17	Trackball to the **TCPIP** tab and press the **Set** button on the control panel.	Connectivity dialog box - TCPIP tab activated:

Table 8-3 Software Re-Installation/Upgrade (Continued)

Step	Instruction	Expected Result
18	Trackball to the **Save Settings** button and press the **Set** button on the control panel.	A message is displayed prompting for system re-boot: 
19	Click **OK** to re-boot the system.	When the installation process is complete, the system will re-boot in regular display mode (Probe Select Screen). Note: If this is a new software version, an adhesive Rating Plate is supplied with the software CD. Adhere the plate in the appropriate position under the Bottom Assembly.

8-5-2 Setting the BIOS

NOTE: This procedure is applicable to both MODBR949 and MODBR929 versions.

1) While booting, press F2 “Config / Diag” on alphanumeric keyboard
2) Type the password “**marlin04**”.
3) Exit and save presets.
4) Select <Exit> section and load “Setup Defaults”.
5) Select <Main> section.
6) Set correct system time and Date. Set Date using next format MM/DD/YYYY
7) Check that IDE primary master is detected.
8) Select <Advanced> section
9) Perform the following changes in the “*Advanced*”:

Option	Value
\Advanced\PnP OS Installed	No
\Advanced\Secured Setup Configuration	No
\Advanced\PCI configuration\Assign IRQ to PCI VGA	No
\Advanced\IO Device Configuration\Serial Port A	Enabled
\Advanced\IO Device Configuration\Serial Port B	Enabled
\Advanced\IO Device Configuration\OnChip Audio Device	Enable

10) Perform the following changes in the <*Security*>:

Option	Value
\Security\Set Supervisor Password	marlin04
\PNP/PCI\IDE DMA transfer access	Enabled

11) Perform the following changes in the <*Power*>

Option	Value
\Power\Wake Up Events\IRQ1	Disabled
\Power\Wake Up Events\IRQ12	Disabled
\Power\Wake Up on LAN	Disabled

12) Perform the following changes in the <*Boot*>:

Option	Value	Comments
\Boot\ATX AC Power Boot Mode	Desktop	
\Boot\Boot Device Priority		
\Boot\ Boot Device Priority 1 - st Boot device	CDROM Drive	Highlight CDROM Drive, Hold Shift Button and Press “+” to move to upper position
\Boot\ Boot Device Priority 2 – nd Boot device	Hard Drive	
\Boot\ Boot Device Priority 3 –rd Boot Device Removable Devices		
\Boot\ Boot Device Priority\Network Boot		
\Boot\Display Control\LCD Brightness	255	Hold Shift and press “+” button to set value

13) Save and exit BIOS Setup.

14.) Reboot the system and check that Supervisor PASSWORD was installed properly.

8-5-3 BIOS Firmware Update

WARNING: When performing this procedure, it is strongly recommended that both AC power and battery power be available to the Vivid-i™ scanner to prevent causing problems in the Back End in the event of AC power fluctuation or power failure.

In addition, BIOS Firmware Update is a sensitive procedure; allow the process to run to completion without interruption. *Failure to do this could result in unrecoverable damage to the system!*

1) Make sure the Vivid-i™ scanner is connected to both battery and AC power.
2) Insert the Vivid-i™ software installation CD in the DVD\CD-R and close the tray.
3) Hold down the ON/OFF button on the control console for 3 seconds.

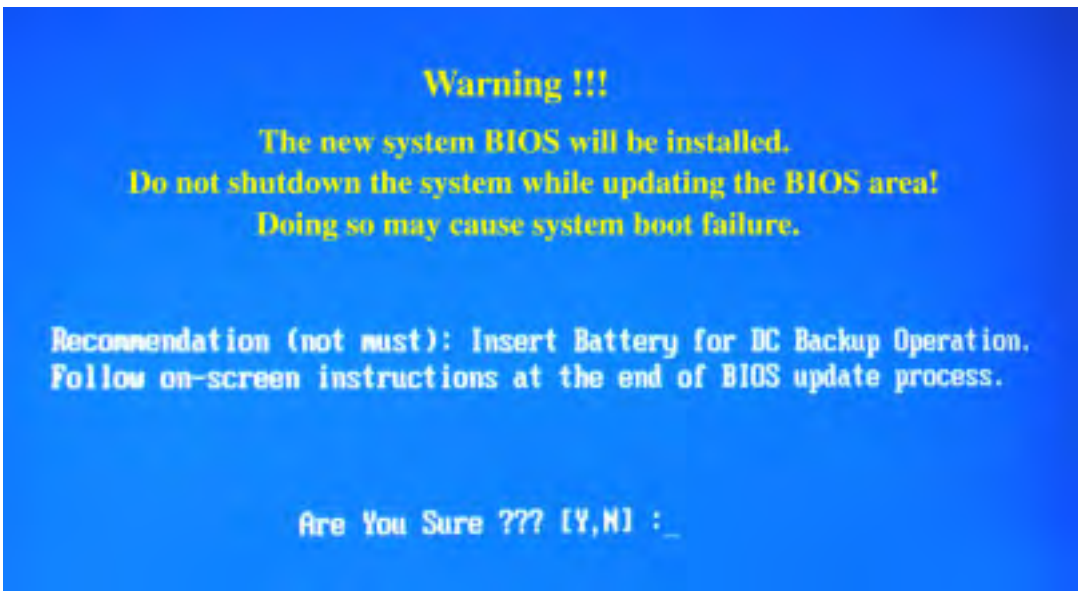
   The system powers ON and when system boot-up from the CD is complete, the following options are displayed in the DOS screen, prompting you to select the required option:

4) Select option: **3: BIOS Update MODBR949**

   A prompt for password is displayed:

5) Type **geulsservice** and press <**Enter**>.

   *The following screen opens displaying a flashing **Warning** message not to shutdown the system during this procedure*:


Warning !!!
The new system BIOS will be installed.
Do not shutdown the system while updating the BIOS area!
Doing so may cause system boot failure.
Recommendation (not must): Insert Battery for DC Backup Operation.
Follow on-screen instructions at the end of BIOS update process.
Are You Sure ??? [Y,N] :_

Note: use of the battery for DC backup during this procedure is also recommended in this screen.

6) To continue, type **Y**.

The following screen is displayed, showing the progress of the BIOS update process:

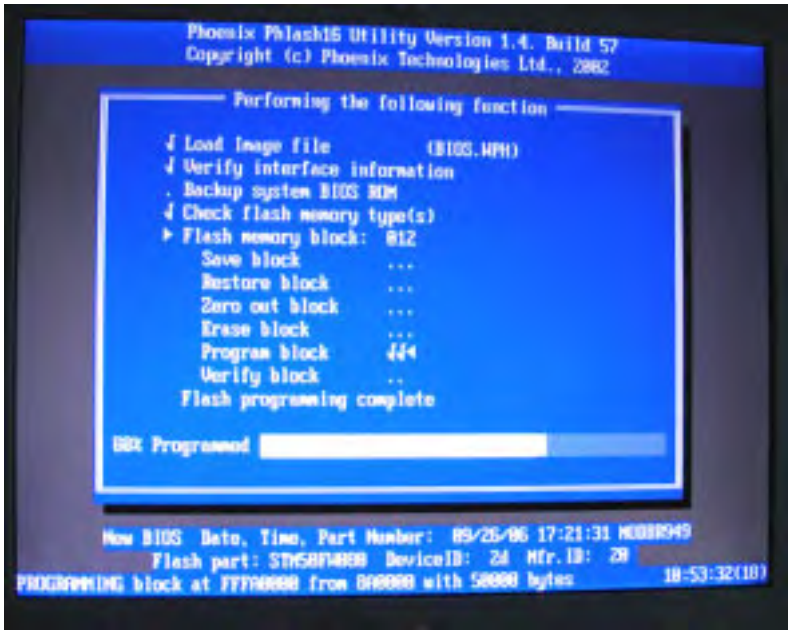
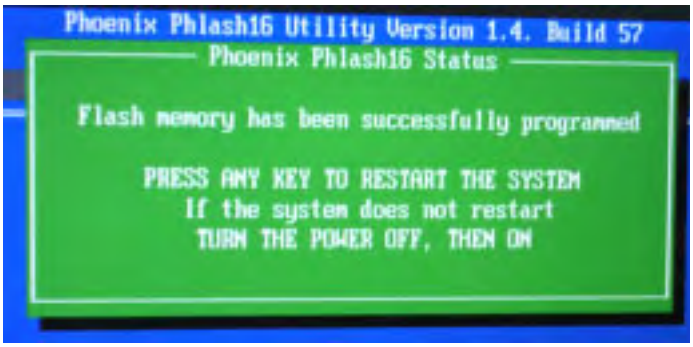

Phoenix Phlash16 Utility Version 1.4. Build 57
Copyright (c) Phoenix Technologies Ltd., 2002
Performing the following function
√ Load image file (BIOS.WPH)
√ Verify interface information
. Backup system BIOS ROM
√ Check flash memory type(s)
▸ Flash memory block: 012
Save block ...
Restore block ...
Zero out block ...
Erase block ...
Program block ###
Verify block ..
Flash programming complete
000 Programmed
New BIOS Date, Time, Part Number: 09/26/06 17:21:31 M000R949
Flash part: STM50FW400 DeviceID: 24 Mfr.ID: 20
PROGRAMMING block at FFF00000 from 000000 with 50000 bytes
10:53:32(10)

Figure 8-226 BIOS Update in Progress

When the BIOS Update process is complete, the following message is displayed:


Phoenix Phlash16 Utility Version 1.4. Build 57
Phoenix Phlash16 Status
Flash memory has been successfully programmed
PRESS ANY KEY TO RESTART THE SYSTEM
If the system does not restart
TURN THE POWER OFF, THEN ON

7) Press any key to restart the system.

The boot-up screen is displayed, as shown in Figure 8-227 on page 8-85.

Note: If the system does not restart, turn the power OFF, then ON. (In the event that the system boot-up screen is not displayed, repeat the procedure, from step 1).

Figure 8-227 Boot-up Screen after Completion of BIOS Update

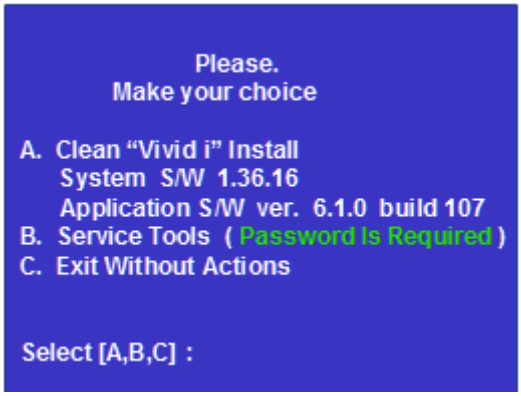
8-5-4 Formatting and Partitioning the Hard Disk - Automatic Procedure

1) Connect the DVD\CD-RW drive to the system's USB and connect the power supply of the drive to power outlet.
2) Place the GHOST CD inside the DVD\CD-RW Tray and close tray.
3) Turn ON power to the system and allow it to boot up from the CD.

   A menu will appear prompting for selection of one of four options:

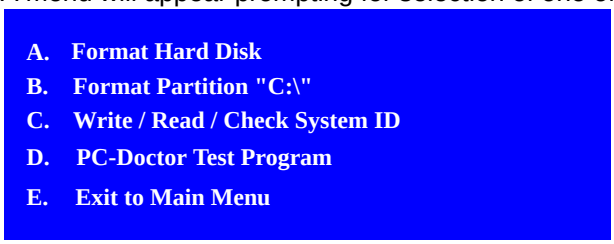
4) Select option: **1: Vivid_i Full Clean Install (System + Application Software**)

   A menu will appear prompting for selection of the required option:


Please.
Make your choice
A. Clean "Vivid i" Install
System S/W 1.36.16
Application S/W ver. 6.1.0 build 107
B. Service Tools (Password Is Required)
C. Exit Without Actions
Select [A,B,C] :

5) Select "**B**" service tools.
6) Type in the password "**geulsservice**" and press <**Enter**>.

   A menu will appear prompting for selection of one of five options:



7) Select "**A**" to format and re-partition the complete hard disk.

Note: Note the system will partition hard disk as follows:
C: = 3GB
D: = 5GB
F: = 1GB
E: = Remaining space (i.e. complete hard-disk size *minus* 9GB for partitions C, D, and F).

IMPORTANT: ***Do not stop the operation during this process!***

8) When complete, continue with the software installation procedure. Refer to the relevant section.

Note: In the event that the above process fails, one can perform the hard-disk partitioning procedure manually, as described below.

8-5-5 Formatting and Partitioning the Hard Disk - Manual Procedure

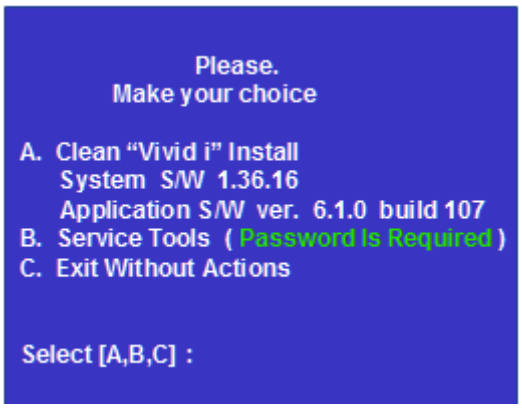
1) Insert the Vivid-i™ software installation CD in the DVD\CD-R and close the tray.

2) Hold down the ON/OFF button on the control console for 3 seconds.

   The system powers ON and when system boot-up from the CD is complete, the following options are displayed in the DOS screen, prompting you to select the required option:

3) Select option: **1: Vivid_i Full Clean Install (System + Application Software**)

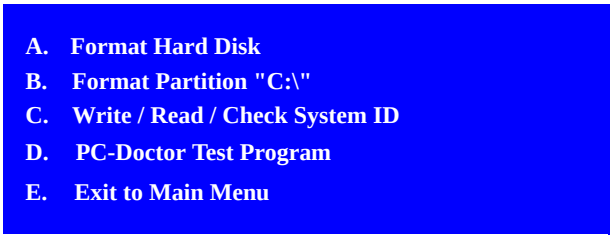
   A menu will appear prompting for selection of the required option:


Please.
Make your choice
A. Clean "Vivid i" Install
System S/W 1.36.16
Application S/W ver. 6.1.0 build 107
B. Service Tools (Password Is Required)
C. Exit Without Actions
Select [A,B,C] :

4) Select option **B Service Tools**.

5) When prompted for the password, type **geulsservice** and press <**Enter**>.

   The message "*Loading Tools please wait"* is displayed, then the *Service Tools Options* menu opens:



6) Do not select an option, but press **<Ctrl> + C**.

7) When the message *"EMM386 is running. Available memory is limited to 32MB*" is displayed, click **OK**.

8) When the message "*Terminate batch job (Y/N?)*" is displayed, type **Y**.

9) At the prompt A:\> type **pqmagic** and press <**Enter**>.

The *Partition Magic* Screen is displayed, as shown below.

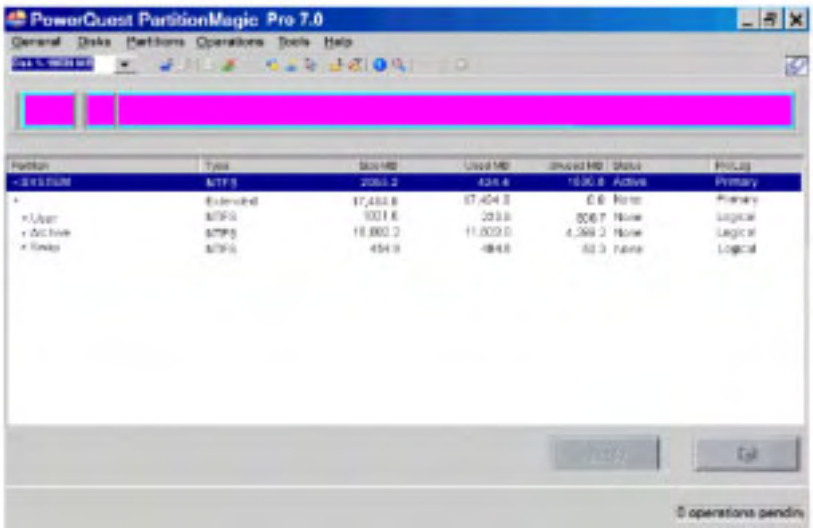


Figure 8-228 Partition Magic Screen

10) With the *System* partition selected (highlighted, as shown in Figure 8-228), delete the partition by selecting the **Delete** Tool under the *Operations* menu, as shown in Figure 8-229 below:

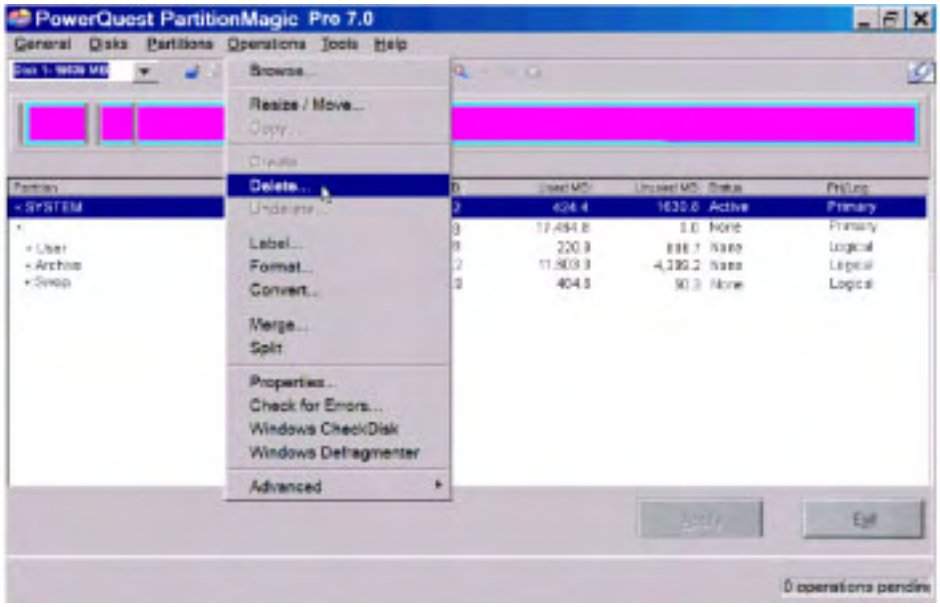


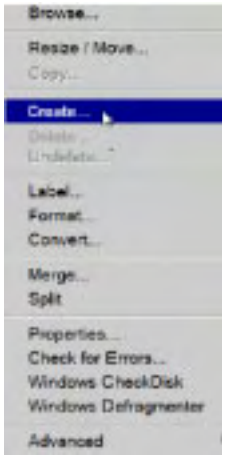
Figure 8-229 Operations Menu

11) When prompted for confirmation of the deletion, click **OK**.

12) Repeat step 10 and step 11 to select and delete each of the remaining partitions in turn, including the partition type *Extended*.

The non-partitioned hard disk will now be shown on the Partition Magic Screen with all disk space listed as *Unallocated* (for example, 19,594.9 MB).

13) With *Unallocated* selected (highlighted), create the first partition by selecting the **Create** Tool under the *Operations* menu, as shown below:



14) In the dialog box displayed, select the following:

Partition: **Primary Partition**

Partition Type: **NTFS**

15) Type the Label as: **SYSTEM**

16) Type the size required. This should be at least 3GB (up to 4GB).

17) Activate the **Beginning of Unallocated** checkbox.

18) When done, click **OK**.

The System partition and allocated space is now listed in the *Partition Magic Screen*.

19) With the System partition selected (highlighted), select the **Advanced Tool** under the *Operations* menu.

20) In the dialog box displayed, click **Set Active**, then click **OK**.

21) When the message "*Are you sure you want to change the active partition?"* is displayed, click **OK**.

22) With **Unallocated** selected in the *Partition Magic Screen*, repeat step 15 and step 16 to create the next partition, using the following:

Partition: **Logical Partition**

Partition Type: **NTFS**

23) Type the Label as: **USER**

24) Type the size required. This should be at least 5GB (up to 6GB).

25) Activate the **Next Unallocated** checkbox.

26) When done, click **OK**.

The User partition and allocated space is now listed in the *Partition Magic Screen*.

27) With **Unallocated** selected in the *Partition Magic Screen*, repeat step 15 and step 16 to create the next partition, using the following:

Partition: **Logical Partition**

Partition Type: **NTFS**

28) Type the Label as: **SWAP**

29) Type the size required. This should be 1/2 to 1GB - for example, 1022.6.

30) Activate the **End of Unallocated** check box, then click **OK**.

The Swap partition and allocated space is now listed in the *Partition Magic Screen*.

31) With **Unallocated** selected in the *Partition Magic Screen*, repeat step 15 and step 16 to create the next partition, using the following:

Partition: **Logical Partition**

Partition Type: **NTFS**

32) Type the Label as: **ARCHIVE**

Note: The Archive size will be any remaining space (for example, 14,456.9), therefore *do not type over the value displayed*.

The Archive partition and allocated space is now listed in the *Partition Magic Screen*.

33) Click the **Apply** button at the lower right of the screen.

The Batch progress menu is displayed.

34) When the message "*All operations complete*" is displayed, click **OK**.

35) Click **Exit**.

8-5-6 Full Re-ghost and Software Installation

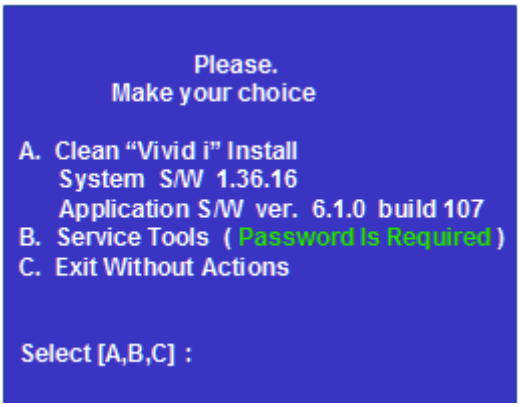
NOTE: During software installation, all peripherals should be removed - including PCMCIA devices (but excluding the DVD\CD-RW driver).

1) Connect the DVD\CD-RW to the USB port at the rear of the system.
2) Connect power to the DVD\CD-RW drive.
3) Place the CD containing the full software version into the *DVD\CD-RW* drive and close the tray.
4) Turn ON the Vivid-i™ system and allow it to boot-up from the GHOST CD.

   The system powers ON and when system boot-up from the CD is complete, the following options are displayed in the DOS screen, prompting you to select the required option:

5) If this is first installation, format the hard disk as described in Formatting and Partitioning the Hard Disk - Automatic Procedure on page 8 - 86. When done, proceed to the next step, below.
6) Select option: **1: Vivid_i Full Clean Install (System + Application Software**)

   A menu will appear prompting for selection of the required option:


Please.
Make your choice
A. Clean "Vivid i" Install
System S/W 1.36.16
Application S/W ver. 6.1.0 build 107
B. Service Tools (Password Is Required)
C. Exit Without Actions
Select [A,B,C] :

7) Select option **A: Install Software**

   The system will prompt you to type in the service password.
8) Type: **geulsservice** and press <**Enter**>.

   The software ghosting will take approximately 15 minutes.

IMPORTANT: ***Do not stop the software installation operation during this process!***

After re-ghosting (requires approximately another 10 minutes), the software installation will be complete. The system will re-start and prompt for the software License Password.

9) Type in the password provided for the specific software, and approve by clicking **OK**.

SW LICENSE
There is no valid license on this system. Enter a valid key below, or contact your GE sales representative.
HW Id
0
OK
Cancel

10) Restart the system and commence scanning.

8-5-7 Installing Software only from DVD

NOTE: During software installation, all peripherals should be removed - including PCMCIA devices (but excluding the DVD\CD-RW driver).

1) Connect the DVD\CD-RW to the USB port at the rear of the system.
2) Connect power to the DVD\CD-RW drive.
3) Place the DVD containing the full software version into the *DVD\CD-RW* drive and close the tray.
4) Turn ON the Vivid-i™ system and allow it to boot-up from the DVD.

   The system powers ON and when system boot-up from the DVD is complete, the following options are displayed in the DOS screen, prompting you to select the required option:

5) Press **2** to perform installation of Vivid-i™ Application Software only from DVD.

   The system will continue to boot up and the following screen is displayed.

When done, the Start Application screen is displayed, as shown in Figure 8-230.

Figure 8-230 Start Application Screen

6) Click on **Install Software** and follow the on-screen instructions.

A warning message is displayed, as shown in Figure 8-231.

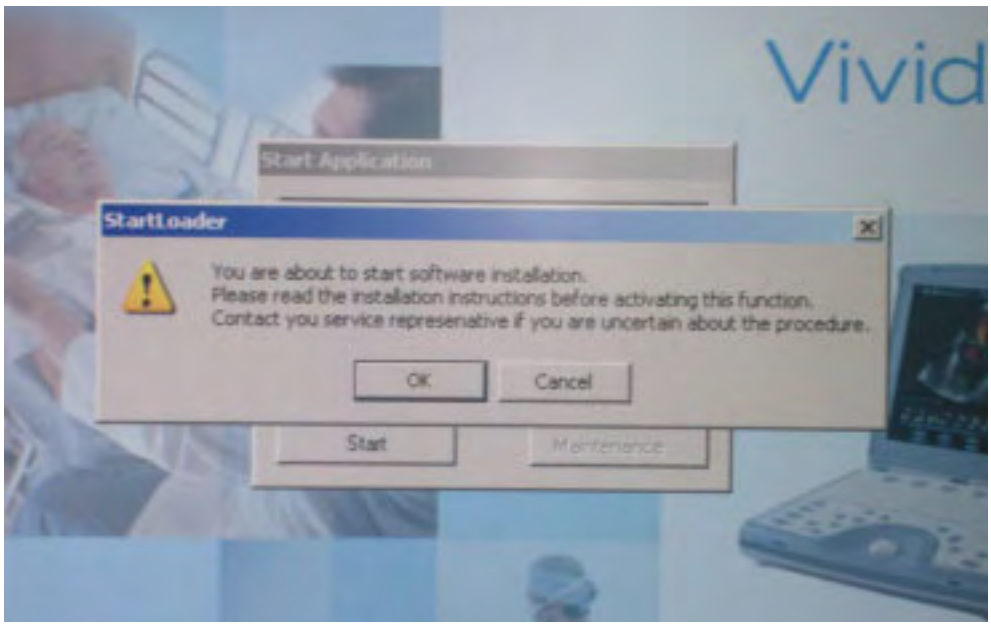
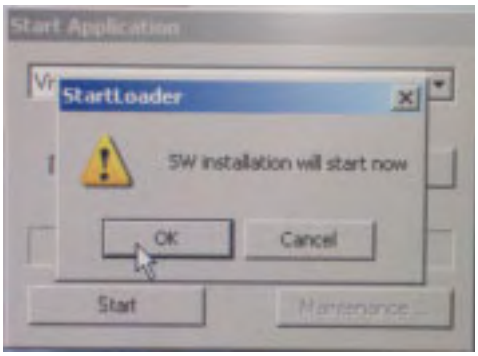


Figure 8-231 Start Software Installation Message

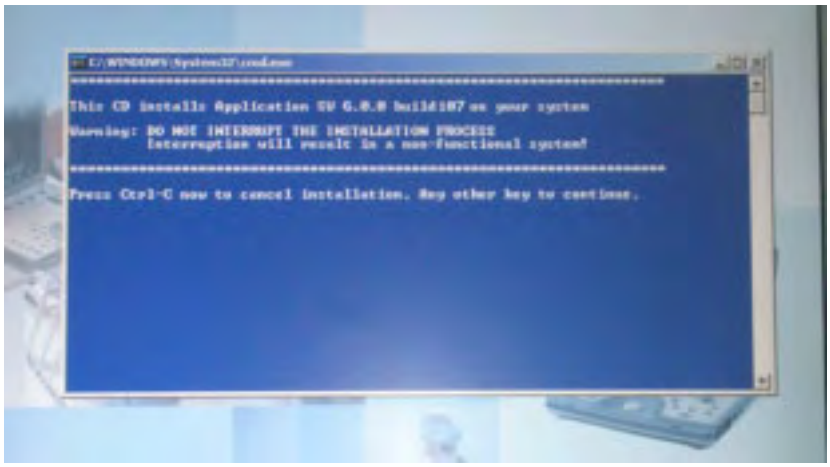
7) Click **OK**.

The following message is displayed:



8) Click **OK** to continue.

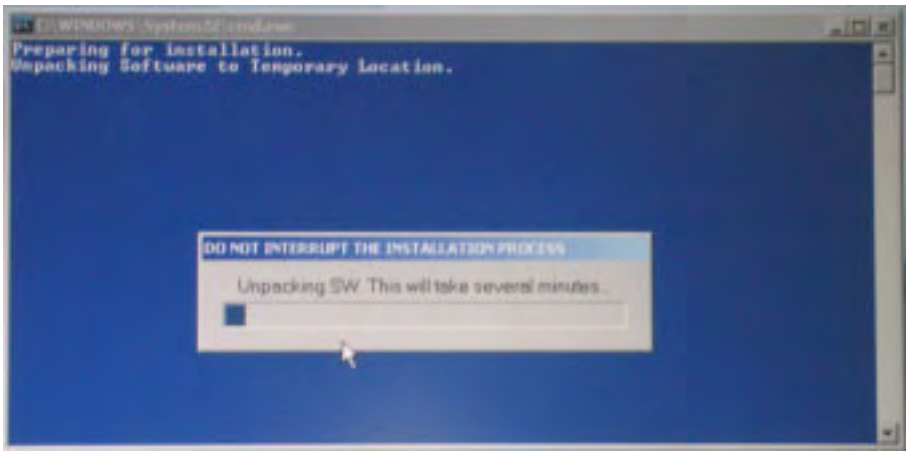
The following warning message is displayed:


This CD installs Application SW 6.0.0 build187 on your system
Warning: DO NOT INTERRUPT THE INSTALLATION PROCESS
Interruption will result in a non-functional system!
Press Ctrl-C now to cancel installation. Any other key to continue.

WARNING: DO NOT INTERRUPT THE INSTALLATION PROCESS. Interruption will result in a non-functional system!

9) Press any key to continue.

Installation commences and the following message is displayed:


Preparing for installation.
Unpacking Software to Temporary Location.
DO NOT INTERRUPT THE INSTALLATION PROCESS
Unpacking SW. This will take several minutes...

When done, the Installation Complete message is displayed:

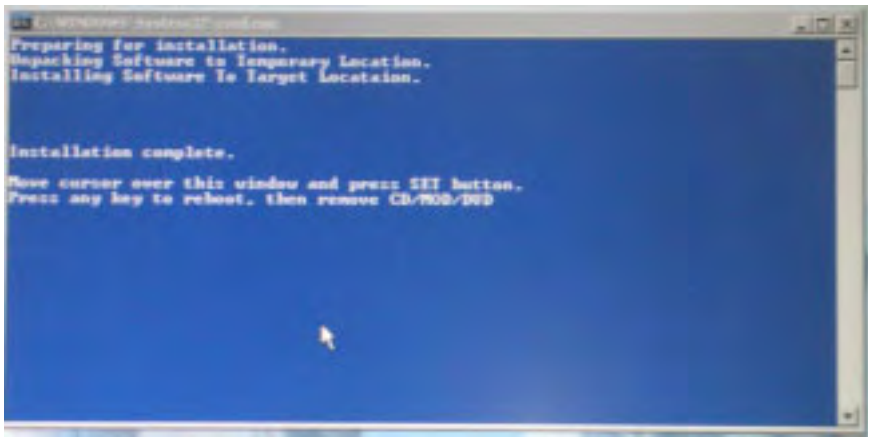

Preparing for installation.
Unpacking Software to Temporary Location.
Installing Software To Target Location.
Installation complete.
Move cursor over this window and press SET button.
Press any key to reboot, then remove CD/MOD/DVD

Figure 8-232 Software Installation Complete Message

10) Move the cursor over the displayed message window and press the **SET** button.

11.) Press any key to re-boot the system.

The system re-boots into Normal Scanning mode.

12.) Press **Config** and then **About**.

The newly-installed software version is now listed under the System Version tab:

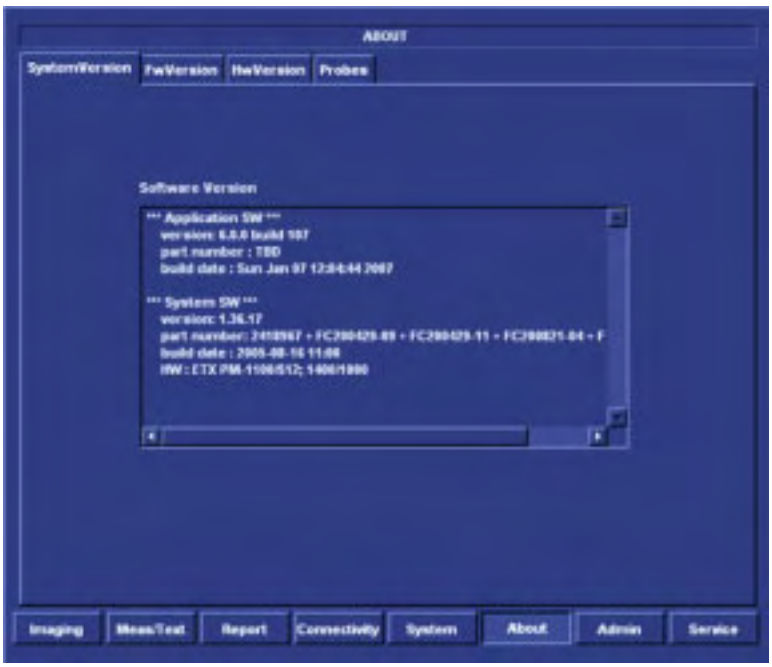


Figure 8-233 Software Version

13.) Remove the DVD from the *DVD\CD-RW* drive and close the tray.

8-5-8 Installing Software only or Patch

1) Connect the DVD\CD-RW to the system's USB port.
2) Connect the DVD\CD-RW power supply to the mains power.
3) Place the *CD with Patch* or *Software Only* CD into the tray and close.
4) Turn ON the system.

   During boot-up, system will prompt to install software or continue booting into regular mode.
5) Click on **Install Software** and follow the on-screen instructions.
6.) When done, the Installation Complete message is displayed (refer to Figure 8-232 on page 8-96).
7) Move the cursor over the displayed message window and press the **SET** button.
8.) Press any key to re-boot the system.

   The system re-boots into Normal Scanning mode.
9.) Press **Config** and then **About**.

   The newly-installed software version is now listed under the System Version tab (refer to Figure 8-233 on page 8-96).
10.) Remove the CD from the *DVD\CD-RW* drive and close the tray.

8-5-9 Installation of PMC Version

1.) Allow the system to boot up into *Normal Scanning* mode.

2) Press **Config**.

The system will prompt you to login.

3) Login as **ADM**.

The default password is **ulsadm**

4) Press the **About** button and activate the **FwVersion** tab; verify that PMC version is 19 or above, as shown in the example in Figure 8-234 below.

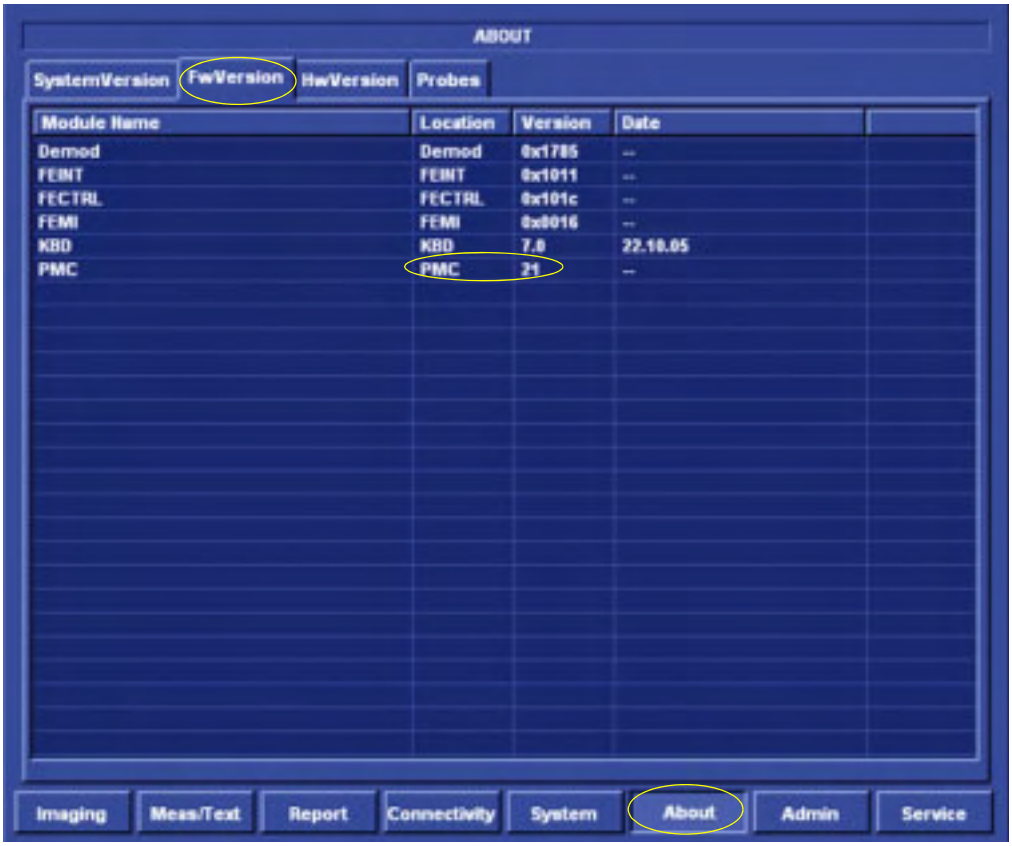


Figure 8-234 Verifying PMC Version

5) Turn the system OFF and remove the DVD USB cable and both battery and AC adapters.

6) Connect the AC adapter **only** (NO BATTERY).

7) Boot up the system in **Maintenance** mode, using the Service Dongle.

8) Go to the following directory: My Computer **C:\marlin\Target\bin**.

9) Run **PMCbootloader.exe** by double-clicking on it - see Figure 8-235 below.

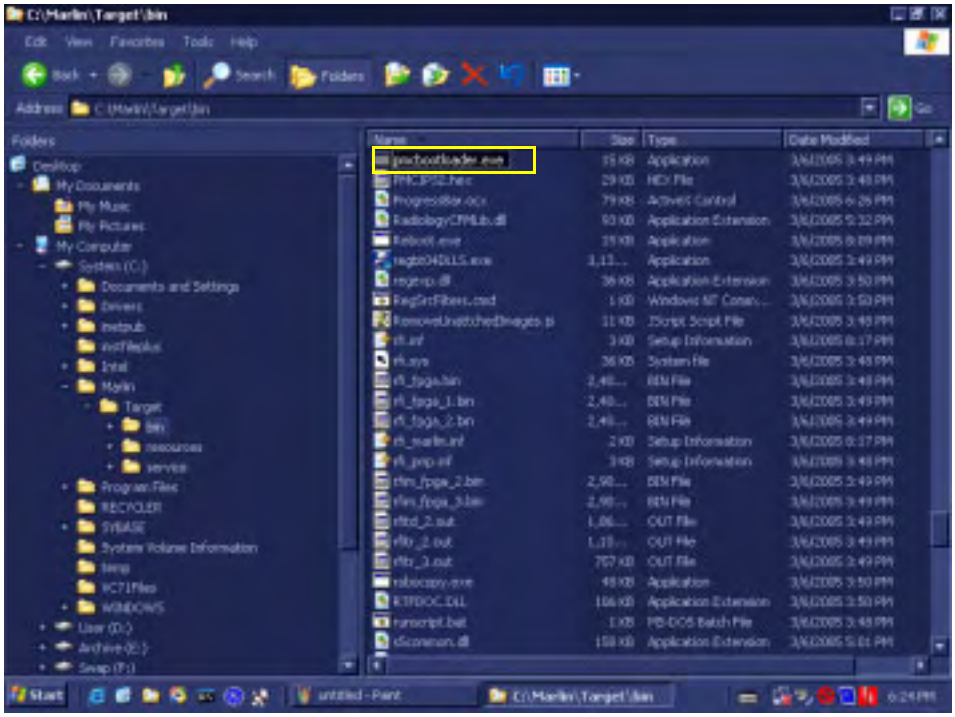
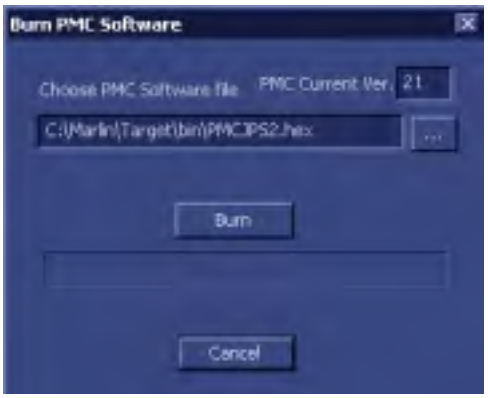


Figure 8-235 Run PMCbootloader.exe

A window is displayed showing the current PMC version and the path of the PMCJPS2.hex file:



10.) Click **Burn**.

The burning process will take approximately 30 seconds.
When done, a brief message will appear "**Burning process failed…**" - see Figure 8-236 below.

Note: The failed message is normal and should be anticipated.

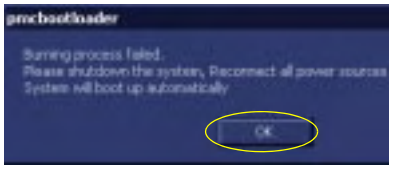


Figure 8-236 Burning Process Failed Message

11) Click **OK**.

The system should shutdown automatically.
(The screen will appear blank but fans will remain running and the On/Off key will be disabled).

12) Power-down the system by removing the AC adapter.

13.) Remove the Service Dongle.

14.) Wait approximately 5 seconds, then boot-up the system again.
Allow the system to boot up into *Normal Scanning* mode.

15) Press **Config**.

The system will prompt you to login.

16) Login as **ADM**.

The default password is **ulsadm**

17) Press the **About** button and activate the **FwVersion** tab; verify that PMC version is now 23, as shown in the example in Figure 8-237 below.

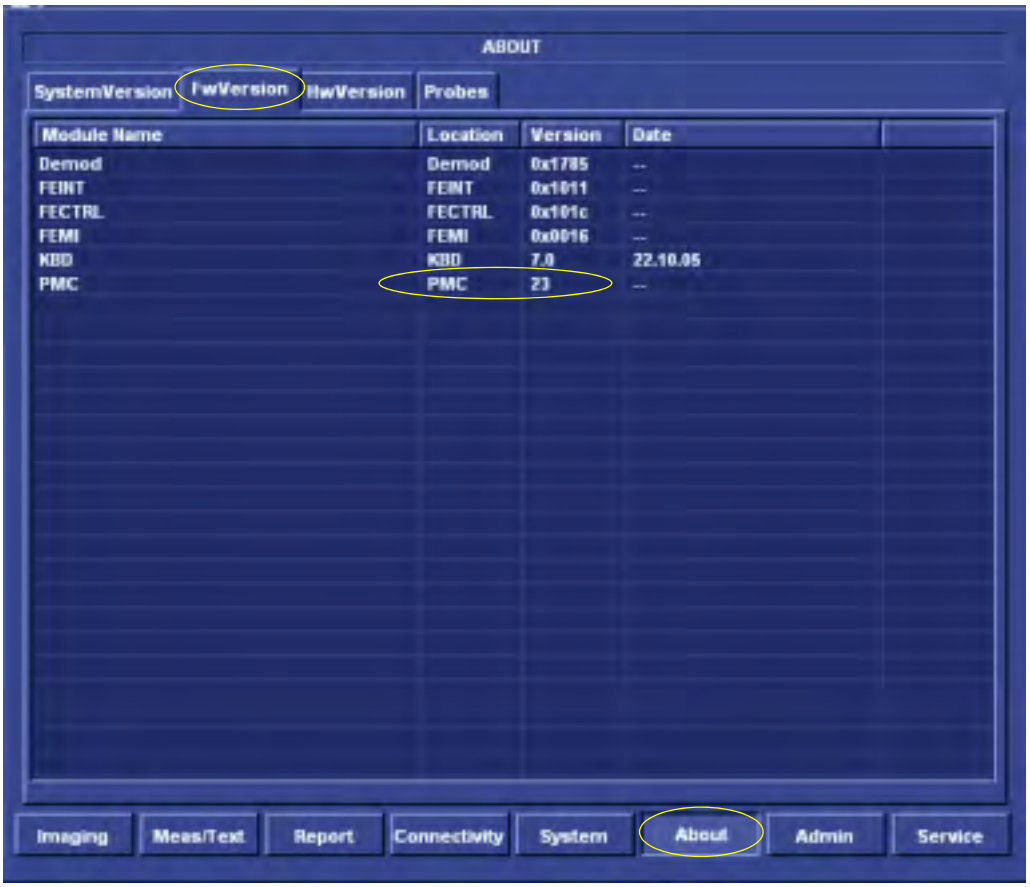


Figure 8-237 Checking the PMC Version

18) In the event that the PMC version is other than 23, burning has failed and it is necessary to repeat the procedure from step 5 above. Also, refer to the note below.

Note: When failing to load PMC version 23

In some cases, PMC loading may fail. Failure is indicated when performing step 17 above if a value other than 23 is shown for the PMC version. In this case the process needs to be repeated. Other indications of failure are that the system does not shut down automatically (step 11 above), or there is a strange pattern on the display.

In the event that failure has occurred, perform a full shut-down (if necessary, remove the AC adapter if the system seems to be "frozen"). Re-boot the system in **Maintenance** mode, using the AC adapter *only*. Continue from step 5 above.

Section 8-6
Performing a Complete System Back-up

NOTICE

IMPORTANT: Contact the customer and request that a full incremental back-up be performed prior to upgrade. If necessary, refer them to the Vivid-i™ User Manual. Ask for removal (delete) of un-necessary patient information, so that the back-up process will require minimal time.

Remind customers that GE Medical Systems strongly recommends that periodic back-ups of their Archive be performed. This routine back-up process will assure the retention of all the information that is temporarily saved into the local Archive (hard-disk). The permanent Archive is the backed-up Archive on the variety of medias.

Do not proceed with the upgrade process if a complete incremental back-up process has not been performed. Contact the On-Line Center to resolve any back-up process issues, before proceeding with the upgrade. Ignore this note if back-up of patient information is not required, as per the customer's instructions.

8-6-1 Database Merge

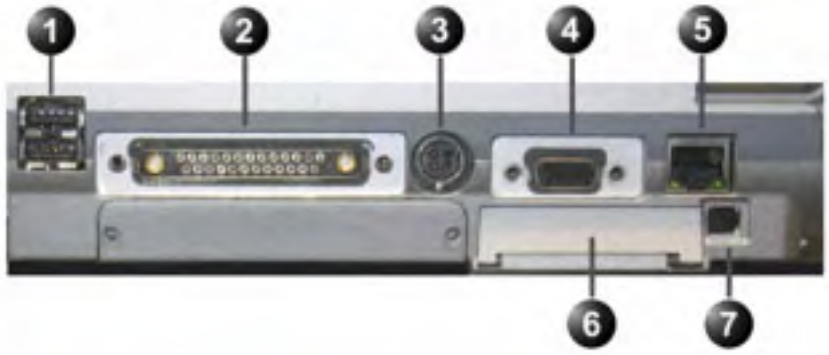
The Database Merge process can be implemented by using the Import/Export functions of the Vivid-i™ system. For details, refer to the Vivid-i™ User Manual.

8-6-2 How to Restore User-defined Presets

For details, refer to Archiving and Loading Presets on page 4 - 15.

Section 8-7
Peripherals

NOTE: This section provides references to the installation procedures for the various peripherals used with the Vivid-i™ portable ultrasound scanner. Connection to the system is via one of the USB ports (unless otherwise stated) on the rear panel, as shown in Figure 8-238 below.



1. Two interchangeable USB ports (digital printer, CD-RW and other peripherals).
2. Docking connector
3. Port for DC IN (AC Adapter).
4. SVGA Output (VCR option or CRT monitor option).
5. LAN 10/100 Base-TX Ethernet network connector
6. PCMCIA port for PC card
7. Ejection lever for PCMCIA device

Figure 8-238 Vivid-i™ Rear Panel

8-7-1 Connecting and Removing Peripherals

For detailed instructions on connecting peripherals to the Vivid-i™ portable ultrasound scanner, refer to the following procedure, as appropriate.

- USB Global Modem on page 3 - 29
- Bluetooth Adaptor on page 3 - 30
- Wireless Network Adaptor on page 3 - 31
- DVD/CD-RW Drive on page 3 - 32
- MOD Drive on page 3 - 34
- USB Memory Stick on page 3 - 35
- Connecting the Black & White Printer on page 3 - 35
- Connecting the Digital Color Printer on page 3 - 36
- Connecting the DeskJet Color Printer on page 3 - 39
- Connecting the VCR on page 3 - 41

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Chapter 9
Renewal Parts

Section 9-1
Overview

9-1-1 Purpose of Chapter 9

This chapter gives you an overview of replacement parts for the Vivid-i™ portable ultrasound scanner.

Table 9-1 Contents in Chapter 9

Section	Description	Page Number
9-1	Overview	9-1
9-2	List of Abbreviations	9-2
9-3	Renewal Parts Lists and Diagrams	9-3
9-4	Peripherals	9-12

Section 9-2
List of Abbreviations

- **Assy** - Assembly
- **BEP** - Back End Processor
- **Ctrl** - Control
- **FEP** - Front End Processor
- **FRU 1** - Replacement part available in parts hub
- **FRU 2** - Replacement part available from the manufacturer (lead time involved)
- **LCD** - Liquid Crystal Display
- **Int** - Internal
- **I/O** - Input/Output
- **PWA** - Printed Wire Assembly
- **Recv** - Receive
- **XFRMR** - Transformer

Section 9-3
Renewal Parts Lists and Diagrams

9-3-1 Mechanical Hardware Parts

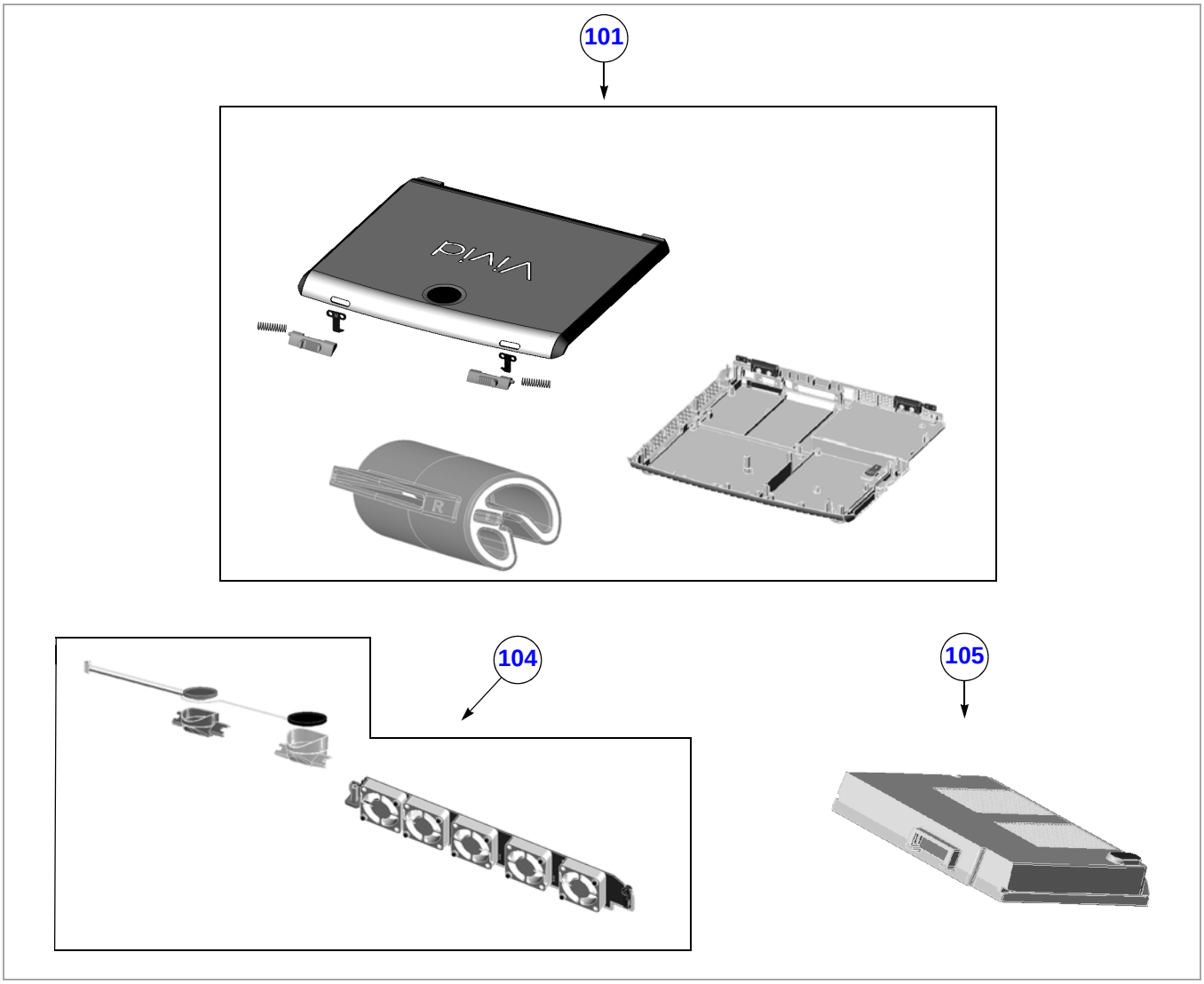


Figure 9-1 Mechanical Hardware Parts

Table 9-2 Mechanical Hardware Parts

Item	Part Name	Part Number	Description	Qty	FRU
101	Cover Kit	2412825-3		1	1
102	Keycap Kit	2410799		1	1
103	Screw Kit	2410801		1	1
104	Fans and Speakers Kit	2412826		1	1
105	Internal Battery Pack	2378963-2	Replaces 2378963	1	1
106	USB Hub	2415026-3		1	1

9-3-2 SafeLock Cart Sub FRUs

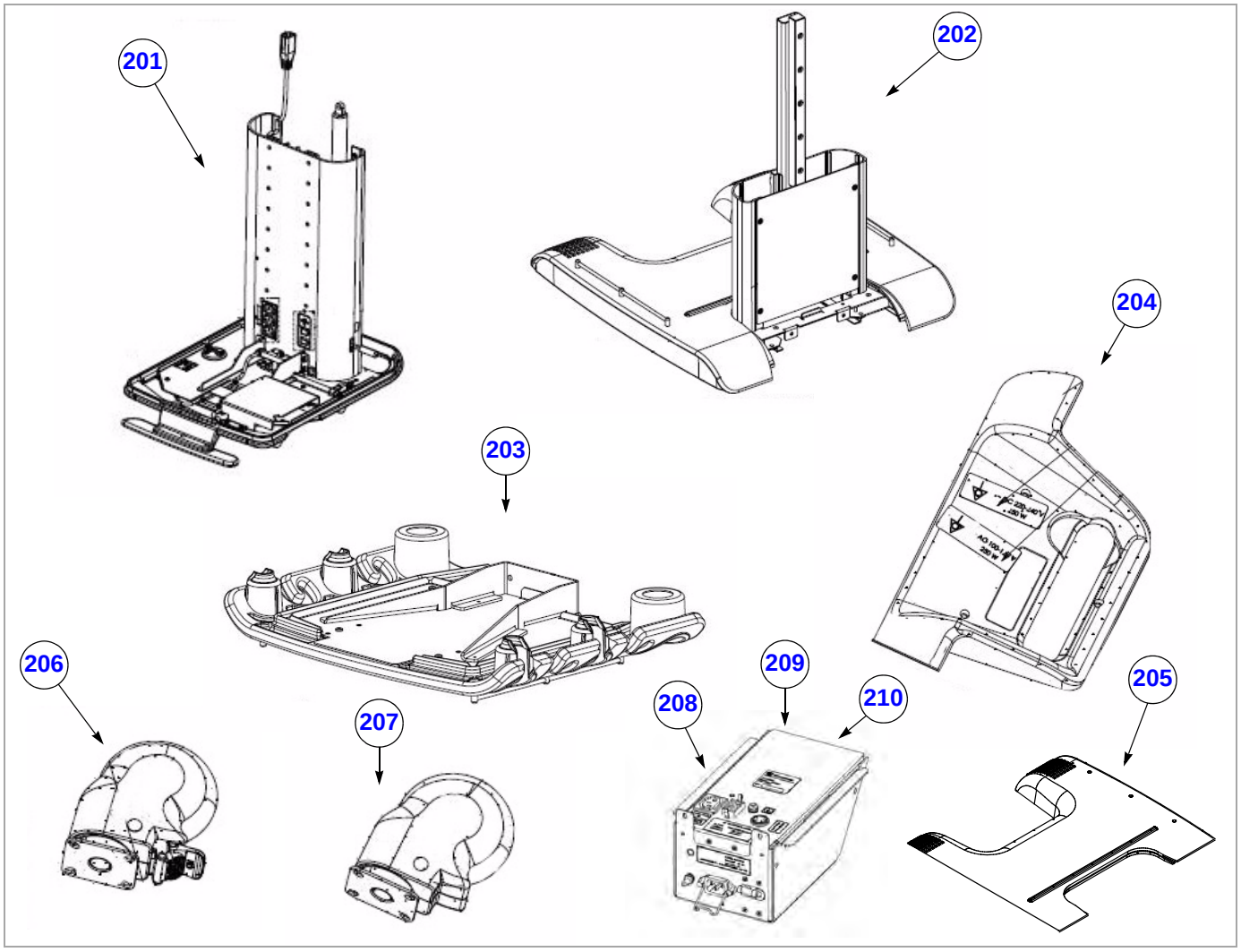


Figure 9-2 SafeLock Cart Sub FRUs - Diagram 1

Table 9-3 SafeLock Cart Sub FRUs

Item	Part Name	Part Number	Description	Qty	FRU
201	Top Shelf Assembly Kit	2415334		1	1
202	Bottom Assembly Kit	2416371	(without wheels)	1	1
203	Probe Shelf Assembly Kit	2410293-2		1	1
204	Lower Shelf Rear Cover	2410303-2		1	1
205	Lower Shelf Package Assembly	2416837			
206	Front Wheels Kit	2415041-2		1	1
207	Rear Wheels Kit	2415042-2		1	1
208	AC Distribution Assy 220-240V	2410247-2			
209	AC Distribution Assy 100-120V	2410247-4			
210	AC Distribution Assy 100V	2410247-6			

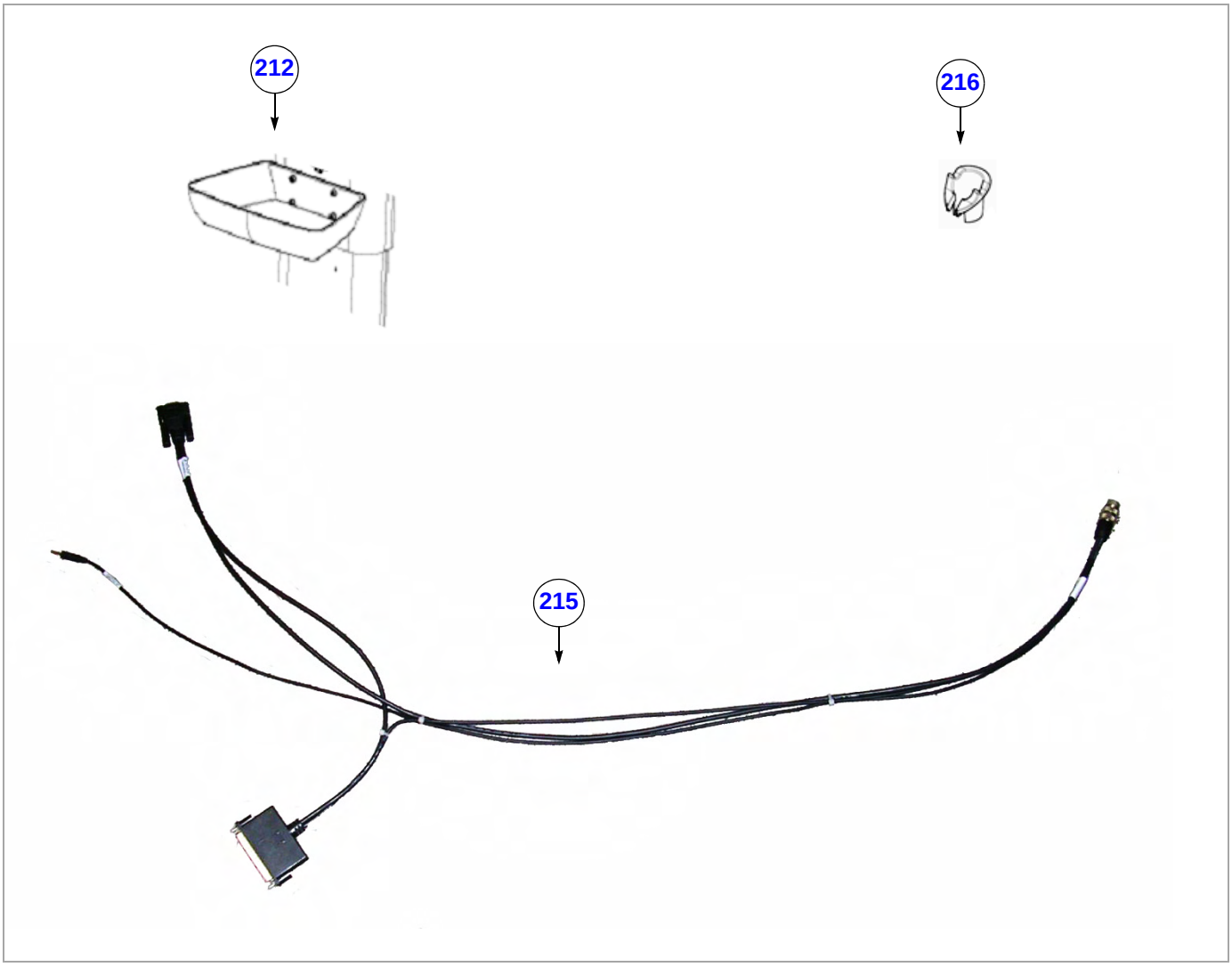


Figure 9-3 SafeLock Cart Sub FRUs - Diagram 2

Table 9-4 SafeLock Cart Sub FRUs

Item	Part Name	Part Number	Description	Qty	FRU
211	Top Shelf Assembly Kit	2416744		1	1
212	SafeLock Cart Basket	2417881-2		1	1
213	Gas Spring	2418914		1	1
214	Upper Cover Rear	2412672-2		1	1
215	Cart Main Cable Harness Kit	2418913		1	1
216	Pencil Probe Holder	2418912		1	1

9-3-3 Electronic Parts

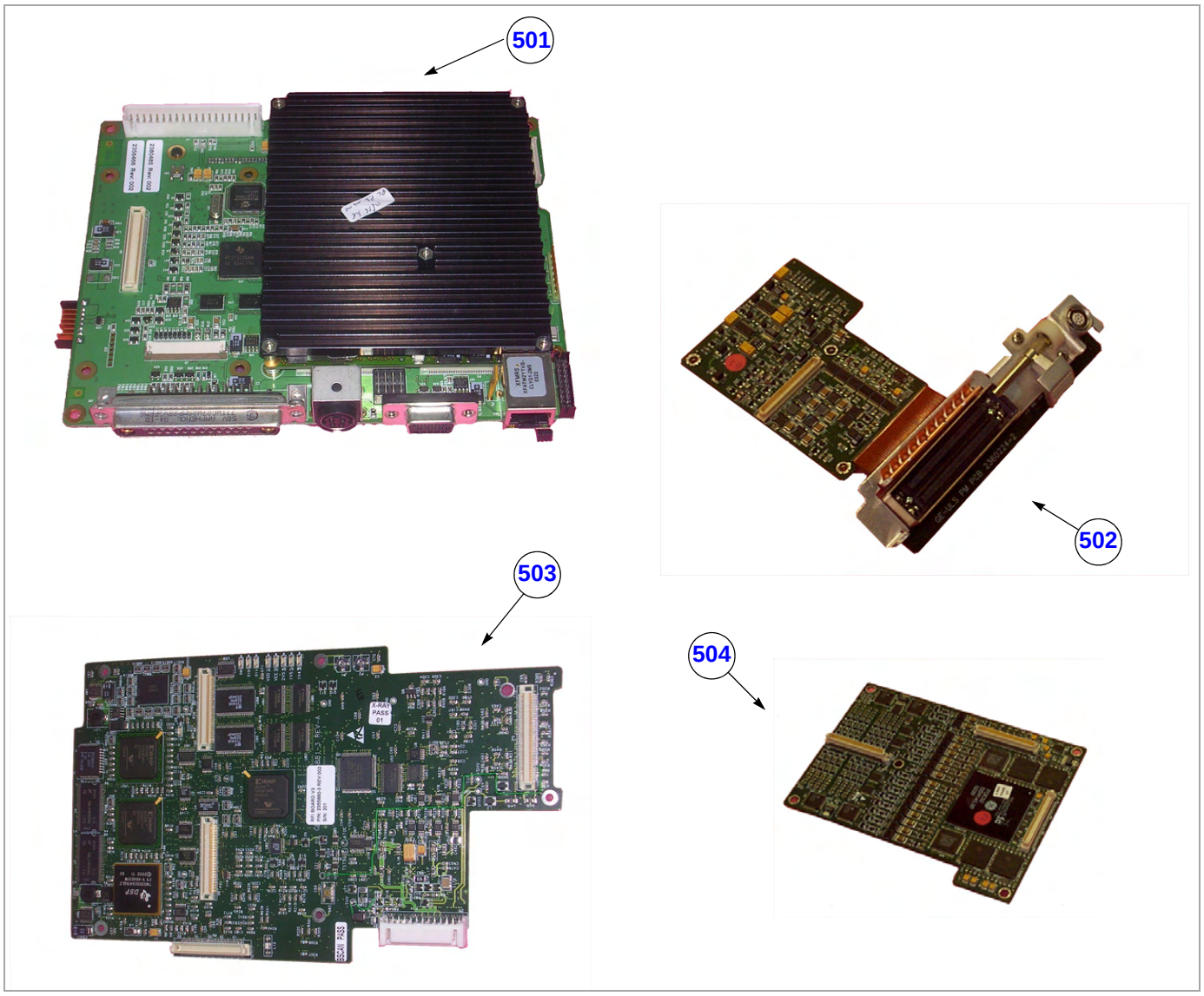


Figure 9-4 Electronic Parts - Diagram 1

Table 9-5 Electronic Parts - Diagram 1

Item	Part Name	Part Number	Description	Qty	FRU
501	BEP Service Kit	2416155	Replaces 2380485	1	1
502	Probe & MUX Assy.	2379846		1	1
503	RFI Board	2355880-4	Replaces 2355880-3	1	1
504	TR32 Board	2354258-7	Replaces 2354258-5 and 2354258-6	1	1
505	Medical Grade 5V Power Supply	2416318-2		1	1

Figure 9-5 Electronic Parts - Diagram 2

Table 9-6 Electronic Parts - Diagram 2

Item	Part Name	Part Number	Description	Qty	FRU
701	Operator Panel (Keyboard Assy.)	2409723	Replaces 2376512-2	1	1
702	Trackball (without bracket)	2405164-2		1	1
703	ECG Module Assy.	2369811		1	1
704	DC Power Supply (LV and HV)	2416397-2	Replaces 2403248	1	1
705	AC Adaptor	2416024-2	For Japan only (includes cables)	1	1
	AC Adaptor	2378947-2	All countries except Japan (includes cables) - Replaces 2378947	1	1
706	Hard Disk Module	2376515-2	Excludes software	1	2
707	LCD Panel Kit	2410809		1	1

9-3-4 Cables

Table 9-7 Cables

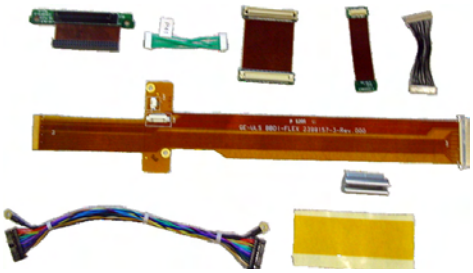
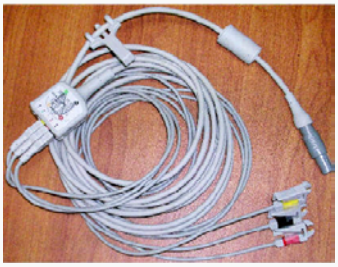
Item	Part Name	Part Number	Description	Qty	FRU
1101	Cable: LAN Isolation Box & Cable Kit	2409727		1	1
1103	Cable: Cable and Flex Kit (for kit contents, see individual items listed below - 1103a refers)	2410810		1	1
1103a	Contents of Cable and Flex Kit (2410810) (see illustration in 1103, above)	2409766	Fans Cable - Vivid-i™		
		2380223-2	ECG Input Flex - Vivid-i™		
		2380773	Baseboard to Keyboard Cable		
		2364875-2	HD Module Flex		
		2410820-2	Connector - New Flat Flexible C30 EAC		
		2399157-3	BBDI Rigid Flex Assy - Ver3 - Vivid-i™		
		2376698-2	Display Flex Cover - Vivid-i™		
		2375178-2	BBDI Inverter Cable - Ver2		
		2361860-2	RFI to Baseboard Flex - Vivid-i™		
1104	Cable: ECG Cable - USA	2418831-2 (replaces 2378938)		1	1

Table 9-7 Cables (Continued)

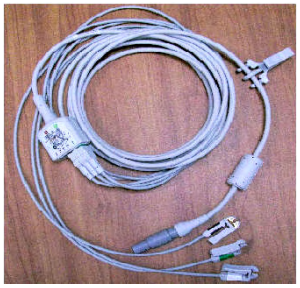
Item	Part Name	Part Number	Description	Qty	FRU
1105	Cable: ECG Cable - Europe	2418832-2 (replaces 2378938-2)		1	1
1106	Cable: External ECG	2413451		1	1
1107	Cable: Vi Power Cable USA 110V	2412094-16		1	1
1108	Cable: Vi Power Cable Continental Europe 2.5A/250V	2412094-2		1	1
1109	Cable: Vi Power Cable Japan 7A/125V	2412094-3		1	1
1110	Cable: Vi Power Cable U.K/Sing.Hong. 2.5A/250V	2412094-4		1	1
1111	Cable: Vi Power Cable Switzerland	2412094-5		1	1
1112	Cable: Vi Power Cable Denmark 2.5A/250V	2412094-7		1	1
1113	Cable: Vi Power Cable Australia 2.5A/250V	2412094-9		1	1
1114	Cable: Vi Power Cable Israel 16A/250V	2412094-10		1	1
1115	Cable: Vi Power Cable China 10V/250V	2412094-11		1	1
1116	Cable: Vi Power Cable Argentina/Mexico 10V/250V	2412094-12		1	1
1117	Cable: Vi Cart Power Cable USA/Canada	2414985		1	1
1118	Cable: Vi Cart Power Cable Europe	2414985-2		1	1
1119	Cable: Vi Cart Power Cable Switzerland	2414985-3		1	1
1120	Cable: Vi Cart Power Cable Denmark	2414985-4		1	1

Table 9-7 Cables (Continued)

Item	Part Name	Part Number	Description	Qty	FRU
1121	Cable: Vi Cart Power Cable Australia	2414985-5		1	1
1122	Cable: Vi Cart Power Cable Britain	2414985-6		1	1
1123	Cable: Vi Cart Power Cable Israel	2414985-7		1	1
1124	Cable: Vi Cart Power Cable Japan	2414985-8		1	1
1125	Cable: Vi Cart Power Cable China	2415383-6		1	1
1126	Cable: Vi Cart Power Cable Germany	2418616		1	1

9-3-5 Probes

Table 9-8 Probes

Item	Part Name	Part Number	Description	Qty	FRU
1401	Probe: 3S - RS	H4000PD		1	1
1402	Probe: 7S - RS	H4000PE		1	1
1403	Probe: 10S - RS	H4000PF		1	1
1404	Probe: 6T - RS	H45531MZ	Must have TEE Probe Interface Module (H45021D)	1	1
1405	Probe: 9T - RS	H45531YM		[a]	1
1406	TEE RS Probe Adaptor	H45021KP		1	1
1407	Probe:P2D - RS	H45021C		1	1
1408	Probe: P6D - RS	H45021CA		1	1
1409	Probe: 8L - RS	H40402LT		1	1
1410	Probe: 3C - RS	H40402LL		1	1
1411	Probe: 8C - RS	2354971		[a]	1
1412	Probe: 4C - RS	5131629		[a]	1
1413	Probe: 5S - RS	5133267		[a]	1
1414	Probe: 12L - RS	5154514		[a]	1
1415	Probe: e8C - RS	2290777		[a]	1

a. Must have BT06 software

Section 9-4
Peripherals

Table 9-10 Approved Peripherals

Item	Part Name	Part Number	Description	Qty	FRU
1501a	Wireless Network Interface - Rest of world (excluding America's, Europe and Japan)	2417391-2		1	2
1501b	Wireless Network Interface - America's	2417388-2		1	2
1501c	Wireless Network Interface - Europe	2417389-2		1	2
1501d	Wireless Network Interface - Japan	2417390-2		1	2
1502	Portable DeskJet Printer HP-450CBI	H45021FE		1	2
1503	Wireless HP460BP with Bluetooth Receiver	H45021FD		1	2
1504	Digital B/W Video Printer (Sony UP-D897MD)	2417965		a	2
1505	Digital Color Video Printer (Sony UP-D23MD)	H45021FG		1	2
1506	VCR Mitsubishi HS-MD30000E PAL S-VHS	H45021FH		1	2
1507	VCR Mitsubishi HS-MD30000U NTSC S-VHS	H45021FK		1	2
1508	VCR video encoder	H45021FL		1	2
1509	Modem USB	H45021FJ		1	1
1510	USB Flash Card (512MB)	H45021G		1	2
1511	DVD-RW	2417993-2	Supplied without power supply. Either use the one already installed on the system, or order the one listed below (P/N 2416318).	1	1
1512	Medical Grade 5V Power Supply	2416318	For DVD-RW or video converter (supplied without power cable; this should be ordered locally)	1	1
1513	MO Drive 9.1GB 5.25" Ext	H45021GB		1	1
1514	External Battery Charger	2417221		1	1

a. Must have BT06 software

Chapter 10
Care and Maintenance

Section 10-1
Overview

10-1-1 Periodic Maintenance Inspections

Having been determined by GE Medical Systems engineers that your Vivid-i™ system has no high-wearing components likely to fail due to frequent use, no Periodic Maintenance Inspections are mandatory. However, some Customer Quality Assurance Programs may require additional tasks and/or inspections to be performed at periods of frequency different from those listed in this manual.

10-1-2 Purpose of Chapter 10

This chapter describes the Care and Maintenance (PM) procedures for the Vivid-i™ ultrasound scanner and its peripherals. These procedures are designed to protect your investment in the Vivid-i™ system, and are intended to **maintain the quality** of system performance.

After delivery and installation of the Vivid-i™ ultrasound unit, your service representative will contact you to schedule the first of several routine service visits. In addition to routine maintenance by trained Field Service Engineers (FSEs), it is recommended that the procedures described in this chapter be observed as part of your own internal routine maintenance program.

Table 10-1 Contents in Chapter 10

Section	Description	Page Number
10-1	Overview	10-1
10-2	Why Perform Maintenance Procedures?	10-3
10-3	Maintenance Task Schedule	10-4
10-4	Tools Required	10-7
10-5	System Maintenance	10-8
10-6	Probe Maintenance	10-15
10-7	Using a Phantom	10-20
10-8	Electrical Safety Tests	10-21
10-9	Excessive Current Leakage	10-34
10-10	Vivid-i™ Inspection Certificates	10-35

10-1-3 Warnings

DANGER: There are several places on the backplane, the AC distribution box, and the DC distribution box that could be dangerous. Be sure to disconnect the system power plug and to open the main circuit breaker before you remove any parts. Proceed with caution whenever power is ON and covers are removed.

DANGER: Do not pull out or insert circuit boards while mains power to the system is ON.

CAUTION: Practice good ESD prevention. Wear an anti-static strap when handling electronic parts and when disconnecting/connecting cables.

CAUTION: Do NOT operate the unit unless all board covers and frame panels are securely in place, to ensure optimal system performance and cooling.
When covers are removed, EMI may be present.

Section 10-2
Why Perform Maintenance Procedures?

10-2-1 Keeping Records

It is good business practice that ultrasound facilities maintain records of quality checks and corrective maintenance. The Vivid-i™ Inspection Certificates (see page 10 - 35) provide the customer with documented confirmation that the Vivid-i™ portable ultrasound scanner is maintained on a periodic basis.

Copies of the Vivid-i™ Inspection Certificates should be kept in the same room as the Vivid-i™ ultrasound scanner, or nearby.

10-2-2 Quality Assurance

In order to gain accreditation from organizations such as the *American College of Radiology* (*USA*), it is the customer's responsibility to have a Quality Assurance program in place for each scanner. The program must be directed by a medical physicist, the supervising radiologist/physician or appropriate designee.

Routine Quality Control testing of the system must be conducted regularly. The same tests are performed regularly during each period, so that changes can be monitored over time and effective corrective action taken, if required.

Testing results, corrective action, and the effects of corrective action, must be documented and maintained on site.

Your GE Medical Systems Service Representative can help you with establishing, performing and maintaining records for a Quality Assurance program. Please contact us for details of your nearest GE Medical Systems Service Representative, who will provide a quotation for this service, as required.

Section 10-3
Maintenance Task Schedule

10-3-1 How Often Should Care & Maintenance Procedures be Performed?

The Customer Care & Maintenance Task Schedule (provided in Table 10-2 on page 10-5) specifies how often the Vivid-i™ ultrasound scanner should be serviced, and outlines items requiring special attention.

NOTE: It is the customer's responsibility to ensure the Care and Maintenance procedures are performed on the Vivid-i™ ultrasound scanner as scheduled in order to retain the high levels of safety, dependability, and system performance.

Your GE Medical Systems Service Representative has an in-depth knowledge of your Vivid-i™ ultrasound scanning system and can best provide competent, efficient service. Please contact us for details of your nearest GE Medical Systems Service Representative, and/or a quotation for services by our qualified professional FSEs.

The service procedures and recommended intervals shown in the Customer Care & Maintenance Task Schedule assumes that you use your Vivid-i™ scanner for an average patient load (10-12 patients per day) and that you do not use it as a primary mobile unit which is transported between diagnostic facilities.

NOTE: If conditions exist which exceed typical usage and patient load, it is strongly recommended to increase the maintenance frequencies.

Table 10-2 Customer Care & Maintenance Task Schedule

Service at Indicated Time	Daily	Weekly	Monthly	Annually	Notes
Clean Probes	•*				* or before each use
Clean Probe Holders	•				
Clean Air Filter			•		More frequently if necessary, depending on the environment
Inspect AC Mains Cable		*	•		*Mobile Unit Check Weekly
Inspect Cables and Connectors			•		
Clean Console			•		
Clean Monitor and Touch Panel			•		
Inspect Wheels, Casters, Brakes and Swivel Locks	*		•		* Mobile Unit Check Daily
Check Control Panel Movement	*		•		* Mobile Unit Check Daily
Console Current Leakage Checks				•	Also after corrective maintenance, or as required by your facility's QA program.
Peripheral Current Leakage Checks				•	Also after corrective maintenance, or as required by your facility's QA program.
Surface Probe Current Leakage Checks				•	Also after corrective maintenance, or as required by your facility's QA program.
Endocavity Probe Current Leakage Checks					As prescribed in the Probe Manual.
Transesphongeal (TEE) Probe Current Leakage Checks					As prescribed in Probe Manual.
Surgical Probe Current Leakage Checks					As prescribed in Probe Manual.
Measurement Accuracy Checks				•	Also after corrective maintenance, or as required by your facility's QA program.
Probe/Phantom Checks				•	Also after corrective maintenance, or as required by your facility's QA program.
Functional Checks				•	Also after corrective maintenance, or as required by your facility's QA program.

Examine the following on a monthly basis:

- Connectors on cables - for any mechanical defects.
- The entire length of electrical and power cables - for cuts or abrasions.
- Equipment - for loose or missing hardware.
- The keyboard - for defects.
- Brakes - for defective operation.

DANGER: To avoid electrical shock hazard, do not remove the panels or covers from the machine. This servicing must be performed by qualified service personnel *only*. Failure to comply, could result in serious injury!

DANGER: If any defects are observed or any system malfunctions occur, DO NOT operate the equipment. Inform a qualified service engineer immediately.

Section 10-4
Tools Required

10-4-1 Special Tools, Supplies and Equipment

10-4-1-1 Specific Requirements for Care & Maintenance

Table 10-3 Overview of Requirements for Care & Maintenance

Tool	Part Number	Comments
Digital Volt Meter (DVM)		
Anti Static Kit	46–194427P231 46–194427P279 46–194427P369 46–194427P373 46–194427P370	Kit includes: anti–static mat, wrist strap and cables for 220 to 240 V system 3M #2204 Large adjustable wrist strap 3M #2214 Small adjustable wrist strap 3M #3051 conductive Ground cord
Anti Static Vacuum Cleaner	46–194427P278 46–194427P279	120V 230V
Safety Analyzer	46–285652G1	DALE 600 KIT (or equivalent) for electrical tests
SVHS VCR Cassette	E7010GG E7010GF	60 minutes 120 minutes
SVHS VCR Head Cleaner		See VCR user manual for requirements
3.5 MOD MEDIA	E8381AA E8381AB	Blank 128 M disk Blank 230 M disk
5.25” MOD MEDIA	2277190	Blank 2.3 M disk Blank 5.2 M disk
5.25” MOD Disk Cleaning Kit (Vingmed)	066E0674	Sony MOA-D51
3.5 MOD Media Cleaner	2117811	Cleans the diskettes
5.25 MOD Media Cleaner		Cleans the diskettes
3.5 MOD Head Cleaner Kit	2148392	Cleans the drive heads
5.25 MOD Head Cleaner Kit		Cleans the drive heads
QIQ Phantom	E8370RB	RMI Grayscale Target Model 403GS
B/W Printer Cleaning Sheet		See printer user manual for requirements
Color Printer Cleaning Sheet		See printer user manual for requirements
Disposable Gloves		
System Service Code		Required in order to enter system diagnostics
User Manual		Current revision
Service Manual		Current revision

Section 10-5
System Maintenance

10-5-1 Preliminary Checks

The preliminary checks take approximately 15 minutes to perform. Refer to the *Vivid-i™ User Manual* whenever necessary.

Table 10-4 System Preliminary Checks

Step	Item	Description
1	Ask & Listen	Ask the customer if they have any problems or questions about the equipment.
2	Paperwork	Fill in the appropriate details at the top of the Vivid-i™ System Inspection Certificate (see page 10-35). Note all probes and system options.
3	Power-up	Turn the system power ON and verify that all fans and peripherals turn on. Watch the displays during power up to verify that no warning or error messages are displayed.
4	Probes	Verify that the system properly recognizes all probes.
5	Displays	Verify proper display on the monitor and touch panel.
6	Presets	Back-up all customer presets on a CD-RW.

10-5-2 Functional Checks

The functional checks take approximately 60 minutes to perform. Refer to the *Vivid-i™ User Manual* whenever necessary.

NOTE: Refer also to Chapter 4 - Functional Checks, for additional details about the functional checks described in this section.

10-5-2-1 System Checks

Table 10-5 System Functional Checks

Step	Item	Description
1	B-Mode	Verify basic B-Mode (2D) operation. Check the basic system controls that affect this mode of operation.
2	CF-Mode	Verify basic CF-Mode (Color Flow Mode) operation. Check the basic system controls that affect this mode of operation.
3	Doppler Modes	Verify basic Doppler operation (PW and CW if available). Check the basic system controls that affect this mode of operation.
4	M-Mode	Verify basic M-Mode operation. Check the basic system controls that affect this mode of operation.
5	Applicable Software Options[a]	Verify the basic operation of all optional modes such as Multi-Image, 3D, Contrast, Harmonics, Cine, Stress Echo,... etc. Check the basic system controls that affect each the operation of each option.
6	Probe Elements	Perform an Element Test on each probe to verify that all the probe elements and system channels are functional.
7	System Diagnostics	Perform the Automatic Test to verify that all boards are functioning according to specifications.
8	Xmit/Recv Elements	Use the Visual Channel Utility on the 10L probe to verify that all system xmit/recv channels are functional.
9	Keyboard Test	Perform the Keyboard Test Procedure to verify that all keyboard controls are OK.
10	LCD Display	Verify basic LCD display functions. Refer to Chapter 3 of the Vivid-i™ User Manual.
11	Measurements	Scan a gray scale phantom and use the measurement controls to verify distance and area calculation accuracy. Refer to Chapter 18 of the Vivid-i™ User Manual, for measurement accuracy specifications.

a. Some software may be considered as standard, depending upon system model configuration

10-5-2-2 Peripheral/Option Checks

If any peripherals or options are not part of the system configuration, the check can be omitted. Refer to the *Vivid-i™ User Manual* for a list of approved peripherals/options.

Table 10-6 GE Approved Peripheral/Hardware Option Functional Checks

Step	Item	Description
1	VCR	Verify record/playback capabilities of the VCR. Clean heads and covers if necessary.
2	B/W Printer	Verify hardcopy output of the B/W video page printer. Clean heads and covers if necessary.
3	Color Printer	Verify hardcopy output of the Color video page printer. Clean heads and covers if necessary.
4	DICOM	Verify that DICOM is functioning properly. Send an image to a DICOM device.
5	InSite/iLinq	Verify that InSite is functioning properly. Ensure two-way remote communications. (Warranty & Contract Customers only)
7	ECG	Verify basic operation with customer.
8	DVD-CDRW	Verify that the DVD-CDRW is functioning properly.
9	MOD	Verify that the MOD is functioning properly.

10-5-3 Input Power Checks

10-5-3-1 Mains Cable Inspection

Table 10-7 Mains Cable Inspection

Step	Item	Description
1	Unplug Cord	Disconnect the mains cable from the wall and system.
2	Mains Cable	Inspect the mains cable and its connectors for any damage.
3	Terminals	Verify that the LINE, NEUTRAL and GROUND wires are properly attached to the terminals, and that no strands may cause a short circuit.
4	Inlet Connector	Verify that the Inlet connector retainer is functional.

10-5-4 Cleaning

10-5-4-1 General Cleaning

Frequent and diligent cleaning of the Vivid-i™ ultrasound unit reduces the risk of spreading infection from person to person, and also helps to maintain a clean working environment.

CAUTION: When performing Cleaning Procedures, to prevent the risk of system damage, always observe the following precautions:

- **Use *only* cleaning materials and solutions recommended in the procedures described in Table 10-8 on page 10-12.**
- **Do not use any solutions or products not listed in the Vivid-i™ User Manual.**
- ***Do not spray any liquid directly onto the Vivid-i™ covers, LCD Display or keyboard!***
- **Do not allow any liquid to drip or seep into the system.**
- **Prior to cleaning, turn OFF power to the system.**

Table 10-8 Vivid-i™ System - General Cleaning

Step	Item	Description
1	LCD Display Cover	On a weekly basis, moisten a soft, non-abrasive folded cloth or sponge with a mild, general purpose, non-abrasive soap and water solution. (**Do not use any solution containing abrasive powder or strong chemicals such as, acid or alkaline**). Squeeze excess liquid from the cloth/sponge, them wipe down the top, front, back and both sides of the unit. ***Do not spray any liquid directly onto the unit!*** Rinse the cloth/sponge with clean running water and wipe the unit surfaces again. Use a dry, soft, lint-free cloth to dry the unit surfaces. Wait for the unit surfaces to dry completely. Note: In the event that disinfection is required or any stubborn stains remain, remove them with a soft, dust-free cloth on which a small quantity of isopropyl rubbing alcohol has been absorbed, as described below for cleaning the Keyboard.
2	LCD Display	On a weekly basis, gently wipe the LCD Display with a dry, soft, lint-free non-abrasive folded cloth. Note: In the event that you see a scratch-like mark on the LCD Display, this may be a stain transferred from the Keyboard or Trackball when the LCD Display Cover was pressed from the outside. Proceed as follows: Wipe or dust the stain gently with a soft, dry cloth. If the stain remains, moisten a soft, lint-free cloth with water or a 50-50 mixture of isopropyl alcohol and water that does not contain impurities. Wring out as much of the liquid as possible then wipe the LCD Display again. ***Do not let any liquid drip into the computer!*** Be sure to dry the LCD Display before closing the cover.
3	Control Panel and Keyboard	**Control Panel:** On a weekly basis, moisten a soft, non-abrasive folded cloth or sponge with a mild, general purpose, non-abrasive soap and water solution or general purpose disinfectant. (**Do not use any solution containing abrasive powder or strong chemicals such as, acid or alkaline**). Squeeze excess liquid from the cloth/sponge, them wipe down the Control Panel. ***Do not spray any liquid directly onto the Control Panel!*** Rinse the cloth/sponge with clean running water and wipe the Control Panel again. Use a dry, soft, lint-free cloth to dry the Control Panel. Wait for the Control Panel surface to dry completely. **Keyboard:** Clean the keyboard as described (above) for cleaning the Control Panel. Note: In the event that disinfection is required or any stubborn stains remain, absorb a small quantity of isopropyl rubbing alcohol on a soft, dust-free cloth. Wipe the surface of the keycaps with the cloth, making sure that no liquid drips on or between the keys. Allow to dry.
4	Probe Holders	Clean the probe holders with warm water and a damp cloth to remove all traces of gel (soaking may be required to remove excess gel).
5	MOD	Clean the drive head and media with the vendor-supplied cleaning kit. Advise the user to repeat this often, to prevent future problems. MOD disks must be stored away from dust and cigarette smoke. Do not use alcohol or benzene to clean the MOD cartridge.
6	DVD - CDRW Drive	Clean the drive head and media with the vendor-supplied cleaning kit. Advise the user to repeat this often, to prevent future problems. CDs must be stored away from dust and cigarette smoke. Do not use alcohol or benzene to clean the CD drive.
7	Peripherals	Clean the peripherals in accordance with the respective manufacturer's directions.

10-5-5 Physical Inspection

Table 10-9 Physical Checks

Step	Item	Description
1	Labeling	Verify that all system labeling is present and in readable condition.
2	Scratches and Dents	Inspect the system for dents, scratches or cracks.
3	LCD Display Cover	Clean the LCD Display Cover as described in Table 10-8 on page 10-12 Verify ease of *up/down* movement and make sure that the LCD Display cover holds its set position when open and that there is no play on the mechanism. Check that the cover latches *open* and *lock* correctly.
4	LCD Display	Clean the LCD Display as described in Table 10-8 on page 10-12 Inspect the LCD Display for scratches and raster burns. Verify proper operation of Contrast and Brightness controls. For details, see LCD Display Adjustment and Calibration on page 3 - 65.
5	Control Panel and Keyboard	Clean the Control Panel and Keyboard as described in Table 10-8 on page 10-12 Inspect the Control Panel and Keyboard. Note any damaged or missing items. (Replace faulty components, as required). Verify proper operation of Control Panel backlighting and TGC sliders.
6	Probe Holders	Clean the probe holders as described in Table 10-8 on page 10-12. Inspect the Probe Holders for cracks or damage.
7	SafeLock Cart	Check all four SafeLock Cart wheels and castors for wear. Check the brakes on each of the two front wheels. Make sure that pressing the brake locks the wheel, preventing it from swivelling or rolling and therefore stopping movement of the SafeLock Cart. Verify that releasing the brakes allows free movement of the SafeLock Cart. Check the SafeLock Cart *raise/lower* motion and verify proper operation of the release mechanism.
9	MOD (if option installed)	Clean the drive head and media with the vendor-supplied cleaning kit. Advise the user to repeat this often, to prevent future problems. MOD disks must be stored away from dust and cigarette smoke. Do not use alcohol or benzene to clean the MOD cartridge.
10	DVD- CDRW Drive	Clean the drive head and media with the vendor-supplied cleaning kit. Advise the user to repeat this often, to prevent future problems. CDs must be stored away from dust and cigarette smoke. Do not use alcohol or benzene to clean the CD drive.
14	Cables and Connectors	Check all internal cable harnesses and connectors for wear, and secure connector seating. Pay special attention to probe strain or bend reliefs.
15	Power Cord	Check the power cord for cuts, loose hardware, tire marks, exposed insulation or other deterioration, and verify continuity. Tighten the clamps that secure the power cord to the unit and the outlet plug to the cord. Replace the power cord and clamp, as required.
16	Shielding and Covers	Check to ensure that all EMI shielding, internal covers, air flow panels and screws are in place. Missing covers and hardware could cause EMI/RFI problems during scanning.

Table 10-9 Physical Checks (Continued)

Step	Item	Description
17	Peripherals	Check and clean the peripherals according to the manufacturer's directions. To prevent EMI or system overheating, dress the peripheral cables inside the peripheral cover.
8	External I/O	Check all connectors for damage and verify that the labeling is good.
9	Power and System Status Indicators	Check for proper operation of all Power and System Status Indicators.
18	Microphone	Check for proper operation of microphone by recording an Audio Test. For details, refer to Microphone Test on page 4 - 21.
10	Battery	Check that the battery is not damaged, does not leak , does not emit an odor, and is not deformed or discolored. Perform the Battery Parameters Test as described in Battery Parameters Test on page 7 - 103. Observe all warnings and cautions for battery handling, recharging, storing, and/or disposal, as listed in Vivid-i™ Battery Safety on page 1 - 14.

10-5-6 Optional Diagnostic Checks

To complete the periodic maintenance checks, perform the diagnostic tests as described in *Chapter 7 - Diagnostics/Troubleshooting*.

- Review the system error log for any problems.
- Check the temperature log to see if there are any trends that could cause problems in the future.

Section 10-6
Probe Maintenance

WARNING: Any evidence of wear on a probe indicates that it must not be used. Improper handling may easily damage ultrasound probes. See the Vivid-i™ User Manual and also refer to the probe manufacturer's handling instructions, for more details.

Failure to follow these precautions can result in serious injury and equipment damage. Failure to properly handle or maintain a probe may also void its warranty.

10-6-1 Probe Checks

Table 10-10 Probe Checks

Step	Item	Description
1	Probe Holder	Check there are no traces of gel on the probe holders. If any gel present, clean the probe holders with warm water and a damp cloth to remove all traces of gel (soaking may be required to remove excess gel).
2	Probes	Check all the probes for wear and tear on the lens, cable and connector. Look for bent pins on the connector and in the connector socket on the unit. Remove any dust from inside the connector sockets. Verify that the EMI fingers around the probe connector socket housing are intact. Check the probe locking mechanism and probe switch. Perform a visual check of transducer pins and connector sockets before connecting a probe. Verify that the system properly recognizes all probes.

10-6-2 Probe Handling

All Vivid-i™ probes are designed and manufactured to provide trouble-free, reliable service. To ensure this, the correct handling of probes is important and the following points should be noted:

- Do not drop a probe or strike it against a hard surface, as this may damage the probe elements and the acoustic lens, or may crack the housing.
- Do not use a cracked or damaged probe. Any evidence of wear indicates the probe must *not* be used. Call your field service representative immediately for a replacement.
- Perform a visual check of the probe pins and system sockets before plugging in a probe
- Avoid pulling, pinching or kinking the probe cable, since a damaged cable may compromise the electrical safety of the probe.
- To avoid the risk of a probe accidentally falling, do not allow the probe cables to become entangled with, or to be caught in the wheels of the system.
- Protect the probe when moving the unit.
- Use a soft cloth and warm, soapy water to clean the probe.

Note: For detailed information on handling endocavity probes, refer to the appropriate supplementary instructions for each probe.

10-6-3 Basic Probe Care

The *Vivid-i™ User Manual* and the individual probe manufacturers' handling cards provide a complete description of probe care, maintenance, cleaning and disinfection. Ensure that you are completely familiar with the proper care of GE probes.

WARNING: Any evidence of wear on a probe indicates that it must not be used. Ultrasound probes can be easily damaged by improper handling. See the Vivid-i™ User Manual and also refer to the probe manufacturer's care cards, for more details.

NOTE: ***Failure to follow these precautions can result in serious injury and equipment damage. Failure to properly handle or maintain a probe may also void its warranty.***

Always perform a visual check of the probe pins and system sockets before plugging in a probe.

When handling probes, always observe the precautions listed in Probe Handling on page 10 - 15.

The TEE and Interoperative probes often have special usage considerations; always refer to the individual probe manufacturers' handling instructions/user manual.

10-6-4 Probe Cleaning

10-6-4-1 Basic Probe Cleaning

NOTE: For details on general probe cleaning, refer to the information provided in the Vivid-i™ User Manual.

NOTE: For specific probe cleaning instructions, refer to the individual probe Users Manual (or care card supplied with the probe).

CAUTION: Failure to follow the prescribed cleaning or disinfection procedures will void the probe's warranty. DO NOT soak the probe or wipe the probe lens with any product not listed in the Vivid-i™ User Manual. Doing so could result in irreparable damage to the probe and/or Vivid-i™ system. Follow the care instructions supplied with the probe.

CAUTION: To help protect yourself from blood-borne diseases when cleaning and handling probes, wear approved, non-allergic disposable gloves.

WARNING: Always disinfect a defective probe before returning it to the manufacturer. Be sure to tag the probe as being disinfected.

10-6-4-2 General Probe Cleaning Instructions

WARNING: Do *not* clean or immerse probes using any of the following products:

- Acetone
- Ammonium chloride
- Alcohol, ethanol, isopropanol, or methanol
- Bleach
- Detergent
- Hydrogen peroxide
- Iodine
- Para-hydroxybenzoic acid
- Aloe vera, perfume, lanolin, or mineral oil

Do not soak or wipe the probe lens with any product listed above (see Warning). Doing so could result in irreparable damage to the probe. Follow the care instructions supplied with each probe. In order to disinfect or sterilize probes without damaging them:

- Use gas sterilization and legally marked, sterile, pyrogen-free probe sheaths on probes used for surgery.
- Use cold chemical sterilization suitable for plastic medical scanning devices.
- Do not immerse a probe beyond the ridge on its case.
- Avoid cleaning and storage temperatures over 60°C (140°F).
-

Warning: Neurological procedures must NOT be performed on a patient with Creutzfield-Jacob disease because probes that have been used for such examinations cannot be adequately sterilized.

Warning: Neurological and intraoperative procedures must be performed with the use of legally marketed, sterile, pyrogen-free probe sheaths. Probes used during neurological surgery must NOT be sterilized with liquid chemical sterilants because of the possibility of neurotoxic residue remaining on the probe.

10-6-4-2-1Cleaning and Sterilizing Probes Used Externally

Table 10-11 Cleaning & Sterilizing Procedure for Probes Used Externally

Step	Description
1	To protect yourself from blood-borne diseases, wear approved, non-allergic disposable gloves.
2	Do not immerse the connector or its strain relief in solution. Use ultrasound probe cleaning towels. Wash the probe and probe cable in warm soap and water solution (below 80°F). Use only mild non-abrasive soap.
3	Follow the manufacturer's cold sterilization instructions to disinfect the probe, including concentration and soaking time; 10 minutes is a typical disinfecting period.
4	Follow step 3 for a much longer duration to sterilize the probe; 10 hours is a typical cold chemical sterilization duration.
5	When complete, thoroughly rinse the washed lens in clear water. Apply sterile distilled water for at least 60 seconds. Air dry.
6	Check the lens for cracking and the cable insulation for separation.
7	Store the probe in its carrying case.

10-6-4-2-2Cleaning and Sterilizing Probes Used Internally

Table 10-12 Cleaning & Sterilizing Procedure for Probes (TEE) Used Internally

Step	Description
1	To protect yourself from blood-borne diseases, wear approved, non-allergic disposable gloves.
2	Do not immerse the connector or its strain relief in solution. Use ultrasound probe cleaning towels. Wash the probe and probe cable in warm soap and water solution (below 80°F). Use only mild non-abrasive soap.
3	Follow the manufacturer's cold sterilization instructions to disinfect the probe, including concentration and soaking time; 10 minutes is a typical disinfecting period.
4	Follow step 3 for a much longer duration to sterilize the probe; 10 hours is a typical cold chemical sterilization duration.
5	When complete, thoroughly rinse the washed lens in clear water. Apply sterile distilled water for at least 60 seconds. Air dry.
6	Check the lens for cracking and the cable insulation for separation.
7	Store the probe in its carrying case.

10-10-7 Returning and Shipping of Defective Probes

WARNING: Always disinfect a defective probe before returning it to the manufacturer. Be sure to tag the probe as being disinfected.

CAUTION: To help protect yourself from blood-borne diseases when cleaning and handling probes, wear approved, non-allergic disposable gloves.

Equipment being returned must be properly clean and free of blood and other potentially infectious contaminants.

GEMS policy states that body fluids must be properly removed from any part or equipment prior to shipment. GEMS employees, as well as customers, are responsible for ensuring that parts/equipment have been properly decontaminated prior to shipment. Under no circumstances should a part or equipment be shipped before being visibly clean and properly disinfected.

The purpose of the regulation is to protect employees in the transportation industry, as well as the persons who will receive and/or open the package.

NOTE: The US Department of Transportation (DOT) has ruled that "items that were saturated and/or dripping with human blood that are now caked with dried blood; or which were used or intended for use in patient care" are "regulated medical waste" for transportation purposes and must be transported as a hazardous material.

Section 10-7
Using a Phantom

See the Basic User Manual “*Customer Maintenance*” for information on using a phantom and quality assurance tests.

Section 10-8
Electrical Safety Tests

10-8-1 Safety Test Overview

The electrical safety tests in this section are based on and conform to NFPA 99 (For USA) and IEC 60601-1 Medical Equipment Safety Standards. They are intended for the electrical safety evaluation of cord-connected, electrically operated, patient care equipment. If additional information is needed, refer to the NFPA 99 (for USA) and IEC 60601-1 documents.

WARNING: ***THE USER MUST ENSURE THAT THE SAFETY INSPECTIONS ARE PERFORMED AT LEAST EVERY 12 MONTHS ACCORDING TO THE REQUIREMENTS OF THE PATIENT SAFETY STANDARD IEC-EN 60601-1. ONLY TRAINED PERSONS ARE ALLOWED TO PERFORM THE ABOVE-MENTIONED SAFETY INSPECTIONS.***

CAUTION: To avoid the risk of electrical shock, the unit under test must not be connected to other electrical equipment. Remove all interconnecting cables and wires. The operator and patient must not come into contact with the unit while the tests are being performed.

CAUTION: Possible risk of infection. Do not handle soiled or contaminated probes and other components that have been in patient contact. Follow appropriate cleaning and disinfecting procedures before handling the equipment.

Test the system, peripherals and probes for current leakage.

WARNING: ***EXCESSIVE CURRENT LEAKAGE CAN CAUSE FATAL INJURY.***

EXCESSIVE CURRENT LEAKAGE CAN INDICATE DEGRADATION OF INSULATION OR OTHER PART AND COULD POTENTIALLY CAUSE ELECTRICAL FAILURE. DO NOT USE PROBES OR EQUIPMENT THAT HAVE EXCESSIVE CURRENT LEAKAGE.

To minimize the risk of a probe causing electrical shock, the customer should observe the following recommendations:

- Do not use a probe that is cracked or damaged in any way
- Check probe current leakage, as shown below:

Probe	Frequency for Checking
Surface	Once per year (or in accordance with QA program)
Endocavitary	Twice per year (or in accordance with QA program)
Any probe	Whenever damage is suspected

10-8-2 GEMS Current Leakage Limits

The following limits are summarized for NFPA 99 (for USA) and IEC 60601-1 Medical Equipment Safety Standards. These limits are GEMS standards and in some cases are lower than the above standards listed.

Table 10-13 Chassis Current Leakage Limits - Accessible Metal Surfaces

Country	Normal Condition	Open Ground	Reverse Polarity	Open Neutral
USA	N/A	0.3 mA	0.3 mA	N/A
Other	0.1 mA	0.5 mA	0.5 mA	0.5 mA

Table 10-14 Type BF Applied Part Current Leakage Limits - Non-Conductive (Floating) Surface and Cavity Probes

Country	Normal Condition	Open Ground	Reverse Polarity	Open Neutral	Mains Applied[a]
USA	0.05 mA	0.05 mA	0.05 mA	0.05 mA	N/A
Other	0.1 mA	0.5 mA	0.5 mA	0.5 mA	5.0 mA

a. Mains Applied is the Sink Leakage Test. In this test, mains (supply) voltage is supplied to the part or equipment to determine the amount of current that will pass (sink) to Ground if a patient comes into contact with the part.

Table 10-15 Type CF Applied Part Current Leakage Limits - Surgical Probes and ECG Connections

Country	Normal Condition	Open Ground	Reverse Polarity	Open Neutral	Mains Applied[a]
USA	0.01 mA	0.05mA	0.05 mA	N/A	0.025 mA
Other	0.01 mA	0.05 mA	0.05 mA	0.05 mA	0.05 mA

a. Mains Applied is the Sink Leakage Test. In this test, mains (supply) voltage is supplied to the part or equipment to determine the amount of current that will pass (sink) to Ground if a patient comes into contact with the part.

10-8-3 Outlet Test Wiring Arrangement - USA & Canada

Test all outlets in the area for proper grounding and wiring arrangement by plugging in the neon outlet tester and noting the combination of lights that are illuminated. Any problems found should be reported to the hospital immediately and the receptacle should not be used.

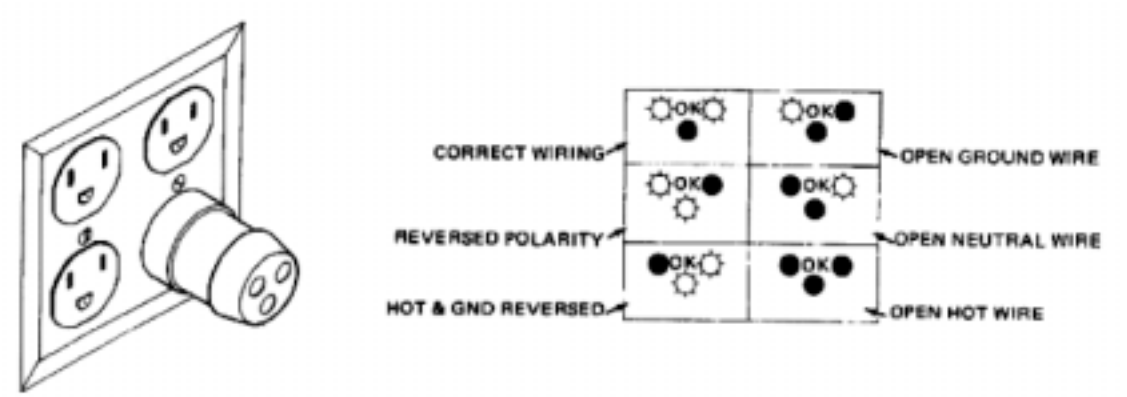


Figure 10-1 Typical Outlet Tester

NOTE: No outlet tester can detect the condition in which the Neutral (grounded supply) conductor and the Grounding (protective earth) conductor have been reversed. If later tests indicate high current leakages, this should be suspected as a possible cause and the outlet wiring should be visually inspected.

10-8-4 Grounding Continuity (Systems with SafeLock Cart)

CAUTION **Electric Shock Hazard!**
The patient or operator must not come into contact with the equipment during this test.

NOTE: This test is not valid for stand-alone Vivid-i™systems and is only applicable when the Vivid-i™ is mounted on the SafeLock Cart.

Measure the resistance between the third pin of the attachment plug and any exposed metal parts on the SafeLock Cart. The Ground wire resistance should be less than **0.2** Ohms. Refer to the procedure in the IEC 601-1.1.

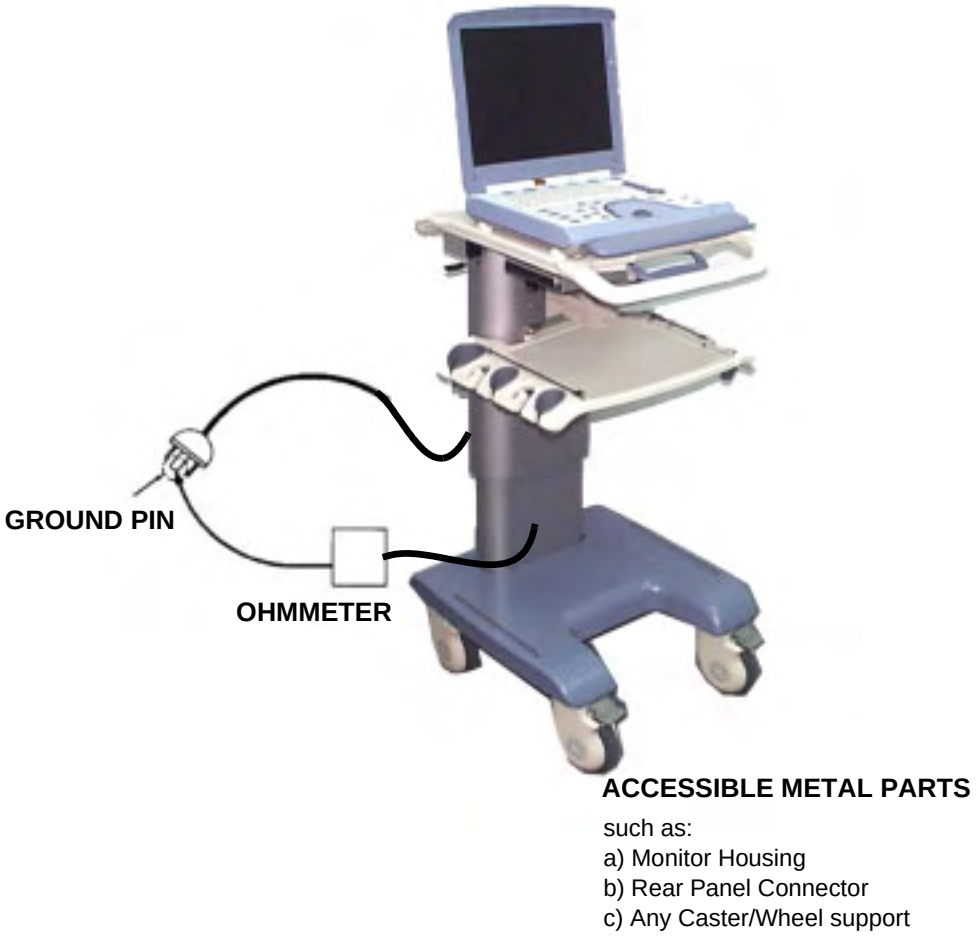


Figure 10-2 Ground Continuity Test

10-8-4-1 Ground Continuity Testing - Generic Procedure

Follow these steps to test the Ground wire resistance:

1.) Turn the Vivid-i™ unit OFF.

2.) Connect one of the Ohmmeter probes to the tested AC wall outlet (Ground pin).

3.) Using the other Ohmmeter probe, touch the exposed metal part of the Vivid-i™ unit.

4) Set the meter **Function** switch to the **Resistance** position.

5) Measure and record the Ground wire resistance.
This should be less than 0.2 Ohms.

10-8-4-2 (Systems with SafeLock Cart)

NOTE: This test is not valid for stand-alone Vivid-i™systems and is only applicable when the Vivid-i™ is mounted on the SafeLock Cart.

10-8-5 Chassis Current Leakage Test

10-8-5-1 Definition

This test measures the current that would flow in a grounded person who touched accessible metal parts of the bedside station, if the Ground wire should break. The test verifies the isolation of the power line from the chassis.

The meter is connected from accessible metal parts of the case to Ground. Measurements should be made with the unit ON and OFF, with the power line polarity Normal and Reversed. Record the highest reading.

DANGER: Electric Shock Hazard.
When the meter's Ground switch is OPEN, *do not touch the unit!*

CAUTION: Equipment damage possibility.
Never switch the polarity and the neutral status when the unit is powered ON. Be sure to turn the unit power OFF before switching them using the **Polarity** switch and/or the **Neutral** switch. Otherwise, the unit may be damaged.

10-8-5-2 Generic Procedure

The test verifies the isolation of the power line from the chassis. The testing meter is connected from accessible metal parts of the case to Ground. Measurements should be made with the unit ON and OFF, with the power line polarity Normal and Reversed. Record the highest reading of current.

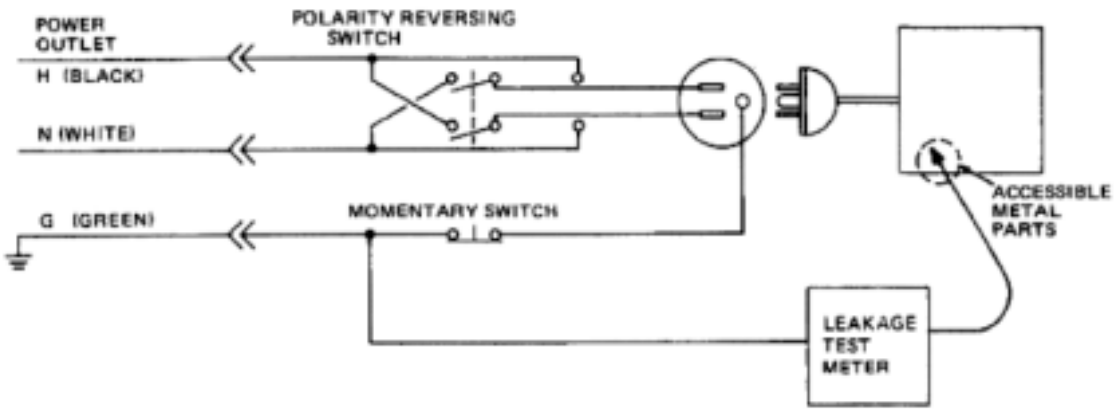


Figure 10-3 Set Up for Chassis Source Current Leakage, IEC 601-1 Clause 19 Continuous Current Leakage and Patient, Auxiliary Currents

When using the Microguard or a similar test instrument, its power plug may be inserted into the wall outlet and the equipment under test be plugged into the receptacle on the panel of the meter. This places the meter in the grounding conductor and the current flowing from the case to Ground will be indicated in any of the current ranges. The maximum allowable limit for chassis source leakage is shown in Table 10-13 on page 10-22.

10-8-5-3 Data Sheet for Chassis Source Current Leakage

The Chassis Source Current Leakage Test passes when all readings measure less than the values shown in Table 10-13. Record all data on the Vivid-i™ System Inspection Certificate (see page 10-35).

Table 10-16 Typical Data Sheet for Chassis Source Current Leakage Test

Unit Power	Tester Polarity Switch	Tester Neutral or Ground Switch	Test 1 Probe Connector	Test 2 Caster Wheel	Test 3 CRT	Test 4 (Optional)	Test 5 (Optional)
Enter Name of tested peripheral here:							
ON	NORM	OPEN					
ON	NORM	CLOSED					
ON	REV	OPEN					
ON	REV	CLOSED					
OFF	NORM	OPEN					
OFF	NORM	CLOSED					
OFF	REV	OPEN					
OFF	REV	CLOSED					

10-8-6 Isolated Patient Lead (Source) Leakage – Lead-to-Ground

10-8-6-1 Definition

This test measures the current which would flow to Ground from any of the isolated ECG leads. The meter simulates a patient who is connected to the monitoring equipment and is grounded by touching some other grounded surface.

Measurements should be made with the Ground *open* and *closed*, with power line polarity *normal* and *reversed*, and with the ultrasound console OFF and ON. For each combination the operating controls, such as the lead switch, should be operated to find the worst case condition.

CAUTION: Equipment damage possibility. To avoid damaging the unit, never switch the polarity and the neutral status when the unit is powered ON. Be sure to turn the unit power OFF before switching them, using the **Polarity** switch and/or the **Neutral** switch.

10-8-6-2 Generic Procedure

Measurements should be made with the Ground **Open** and **Closed**, with power line polarity **Normal** and **Reversed**, and with the Vivid-i™ unit **ON** and **OFF**. For each combination, the operating controls (such as, the lead switch) should be operated to find the worst case condition.

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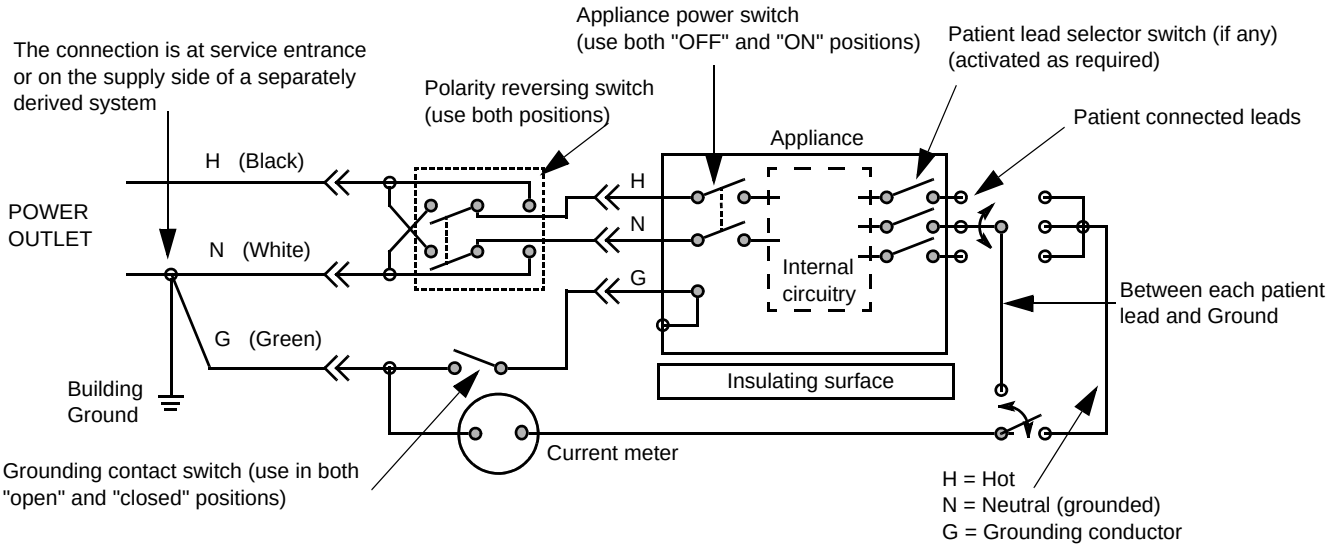
The connection is at service entrance or on the supply side of a separately derived system
Appliance power switch (use both "OFF" and "ON" positions)
Patient lead selector switch (if any) (activated as required)
Polarity reversing switch (use both positions)
Patient connected leads
Appliance
H (Black)
POWER OUTLET
N (White)
G (Green)
H
N
G
Internal circuitry
Between each patient lead and Ground
Building Ground
Insulating surface
Current meter
Grounding contact switch (use in both "open" and "closed" positions)
H = Hot
N = Neutral (grounded)
G = Grounding conductor

Figure 10-4 Test Circuit for Measuring Non-Isolated Patient Leads

10-8-7 Isolated Patient Lead (Source) Leakage – Lead-to-Lead

NOTE: Refer to the procedure in the IEC 60601-1.

10-8-8 Isolated Patient Lead (Sink) Leakage - Isolation Test

NOTE: Refer to the procedure in the IEC 60601-1.

CAUTION: Line voltage is applied to the ECG leads during this test. To avoid the risk of possible electric shock, the system being tested must not be touched by anyone (patient or operator), while the ISO TEST switch is depressed.

NOTE: It is not necessary to test each lead individually, or power condition combinations, as required in previous tests.

10-8-8-1 Data Sheet for ECG Current Leakage

The test passes when all readings measure less than the values shown in the tables below. Record all data on the Vivid-i™ System Inspection Certificate (see page 10-35).

Table 10-17 Maximum Allowance Limit for ECG Lead Leakage Test to Ground

	AC Power Source	Maximum Allowance Limit	
		GROUND OPEN	GROUND CLOSED
Patient Lead-to-Ground Current Leakage Test and Patient Lead-to-Lead Current Leakage Test	115V	10uA	10uA
	220/240V	500uA	10uA

Table 10-18 Maximum Allowance Limit for ECG Lead Isolation Sink Test

	AC Power Source	Maximum Allowance Limit
Patient Lead Isolation Current Test	115V	20uA
	220/240V	5mA

Table 10-19 Typical Data Sheet for ECG Lead-to-Lead Test

ECG Power	Tester Polarity Switch	Tester Ground Switch	Tester Lead Selector				
			RL	RA	LA	LL	C
ON	NORM	CLOSED					
ON	REVERSE	CLOSED					
ON	NORM	OPEN					
ON	REVERSE	OPEN					
OFF	NORM	CLOSED					
OFF	REVERSE	CLOSED					
OFF	NORM	OPEN					
OFF	REVERSE	OPEN					

10-8-9 Probe Current Leakage Test

10-8-9-1 Definition

This test measures the current that would flow to Ground (from any of the probes) through a patient who is being scanned, and who becomes grounded by touching some other grounded surface.

10-8-9-2 Generic Procedure

Measurements should be made with the Ground OPEN and CLOSED, with power line polarity *Normal* and *Reversed*, and with the unit OFF and ON. For each combination, the probe must be active to find the worst case condition.

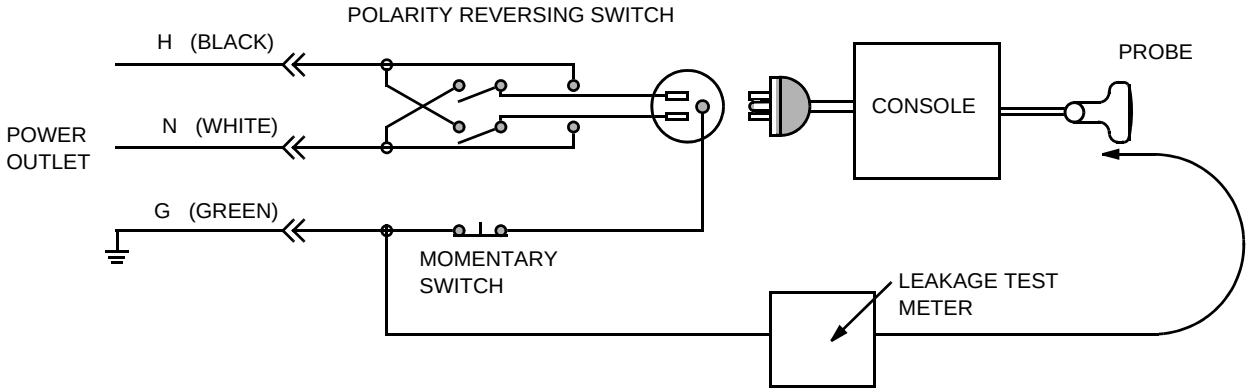

Figure 10-5 Set Up for Probe Current Leakage Test

NOTE: Each probe will have a certain amount of current leakage, depending on its design. Small variations in probe current leakages are normal from probe to probe. Other variations will result from differences in line voltage and test lead placement.

10-8-9-3 No Meter Probe Adapter Procedure

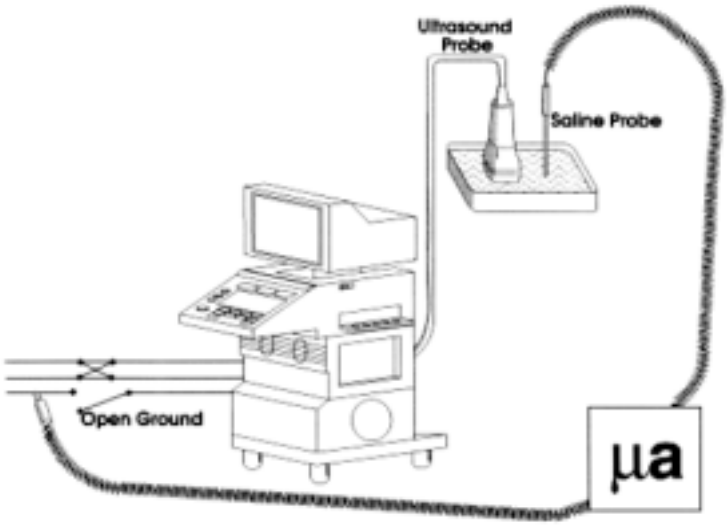

Figure 10-6 Check Without Probe Adapter

Follow these steps to test each transducer for current leakage.

1.) Turn the Vivid-i™ unit OFF.
2.) Plug the unit into the test meter, and the meter into the tested AC wall outlet.
3.) Plug the external probe into the meter “EXTERNAL” connector.
4.) Set the meter's “FUNCTION” switch to EXTERNAL position.
5.) Connect the probe for test with the connector of the console.
6.) Add the saline probe and the imaging area of the probe into the saline bath.
7.) Turn unit power ON for the first part; turn it OFF for the second half.
8.) Depress the ISO TEST rocker switch and record the highest current reading.
9.) Follow the test conditions described in Table 10-20 for every transducer.
10.) Keep a record of the results with other hard copies of Preventive Maintenance data or corrective actions taken.

10-8-9-4 Data Sheet for Transducer Source Current Leakage

The test passes when all readings measure less than the values shown in Table 10-14 and Table 10-15. Record all data on the Vivid-i™ System Inspection Certificate (see page 10-35).

CAUTION: When power to the unit is ON, *never* switch the Polarity and the status of Neutral . Be sure to turn OFF power to the unit before switching them, using the POLARITY switch and/or the NEUTRAL switch. *Failure to comply with this warning may cause damage to the unit!*

Table 10-20 Typical Data Sheet for Transducer Source Current Leakage Test

Transducer Tested:			
Unit Power	**Tester Power POLARITY Switch**	**Tester GROUND or NEUTRAL Switch**	**Measurement**
ON	NORM	OPEN	
ON	NORM	CLOSED	
ON	REV	OPEN	
ON	REV	CLOSED	
OFF	NORM	OPEN	
OFF	NORM	CLOSED	
OFF	REV	OPEN	
OFF	REV	CLOSED	

Section 10-9
Excessive Current Leakage

10-9-1 Possible Causes of Excessive Current Leakage

10-9-1-1 Chassis Fails

Check the Ground on the power cord and plug for continuity. Ensure the Ground is not broken, frayed, or intermittent. Replace any defective part.

Tighten all Grounds. Ensure star washers are under all Ground studs.

Inspect wiring for bad crimps, poor connections, or damage.

Test the wall outlet; verify it is grounded and is free of other wiring abnormalities. Notify the user or owner to correct any deviations. As a work around, check the other outlets to see if they could be used instead.

NOTE: No outlet tester can detect the condition where the white neutral wire and the green grounding wire are reversed. If later tests indicate high current leakages, this should be suspected as a possible cause and the outlet wiring should be visually inspected.

10-9-1-2 Probe Fails

Test the probe in another connector to verify if the fault lies with the probe or the scanner.

NOTE: Each probe will have some amount of leakage, depending on its design. Small variations in probe current leakages are normal from probe to probe. Other variations will result from differences in line voltage and test lead placement. The maximum allowable current leakage for body surface contact probes differs from that of inter-cavity probes. Be sure to enter the correct probe type in the appropriate space on the check list.

If excessive current leakage is slot dependent, inspect the system connector for bent pins, poor connections, and Ground continuity.

If the problem remains with the probe, replace the probe.

10-9-1-3 Peripheral Fails

Tighten all Grounds. Ensure star washers are under all Ground studs.

Inspect wiring for bad crimps, poor connections, or damage.

10-9-1-4 Still Fails

If all else fails, begin isolation by removing the probes, external peripherals, then the on-board peripherals (one at a time) while monitoring the current leakage measurement.

10-9-1-5 New Unit

If the current leakage measurement tests fail on a new unit and if the situation cannot be corrected, submit a Safety Failure Report to document the system problem. Remove the unit from operation.

10-9-1-6 ECG Fails

Inspect cables for damage or poor connections.

Section 10-10
Vivid-i™ Inspection Certificates

Vivid-i™ System Inspection Certificate

Customer Name:		System ID:	Dispatch Number / Date Performed:	Warranty/Contract/HBS
System Type		Model Number:	Serial Number:	Manufacture Date:
Probe 1:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 2:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 3:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 4:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 5:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 6:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 7:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 8:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 9:	Frequency:	Scan Format*:	Model Number:	Serial Number:

*Scan Format: Phased Array, Linear Array, Curved Array, Mechanical Array, or other

Functional Checks (if applicable)	**OK?** or **N/A**
B-Mode (2D) Function	
Doppler Mode Function	
CF-Mode Function	
M-Mode Function	
Applicable Software Options	
Applicable Hardware Options	
Control Panel	
Monitor	
Measurement Accuracy	
GE-approved Peripherals	

Physical Inspection and Cleaning (if applicable)	**Inspect**	**Clean**
Console		
Monitor		
Touch Panel		
Air Filter		
Probe Holders		
External I/O		
Wheels, Brakes & Swivel Locks		
Cables and Connectors		
GE-approved Peripherals (VCR, CD-RW, MOD, Printers)		

Comments:

Vivid-i™ Electrical Safety Inspection Certificate

Electrical Test Performed	Max Value Allowed	Value Measured	OK?	Comments
Outlet (correct Ground & wiring config.)				
System Ground Continuity				
Chassis Source Current Leakage - Probe				
Chassis Source Current Leakage - Caster				
Chassis Source Current Leakage - CRT				
Patient Lead Source Leakage (Lead-to-Ground)				
Patient Lead Source Leakage (Lead-to-Lead)				
Patient Lead Source Leakage (Isolation)				
Peripheral 1 Current Leakage				
Peripheral 1 Ground Continuity				
Peripheral 2 Current Leakage				
Peripheral 2 Ground Continuity				
Peripheral 3 Current Leakage				
Peripheral 3 Ground Continuity				
PROBES				
Probe Number (from page 10-35)	**Max Value Allowed**	**Max Value Measured**	**OK?**	**Comments**
Probe 1:				
Probe 2:				
Probe 3:				
Probe 4:				
Probe 5:				
Probe 6:				
Probe 7:				
Probe 8:				
Probe 9:				

Final Check: All system covers are in place. The Vivid-i™ system scans with all probes, as expected.

Accepted by:

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